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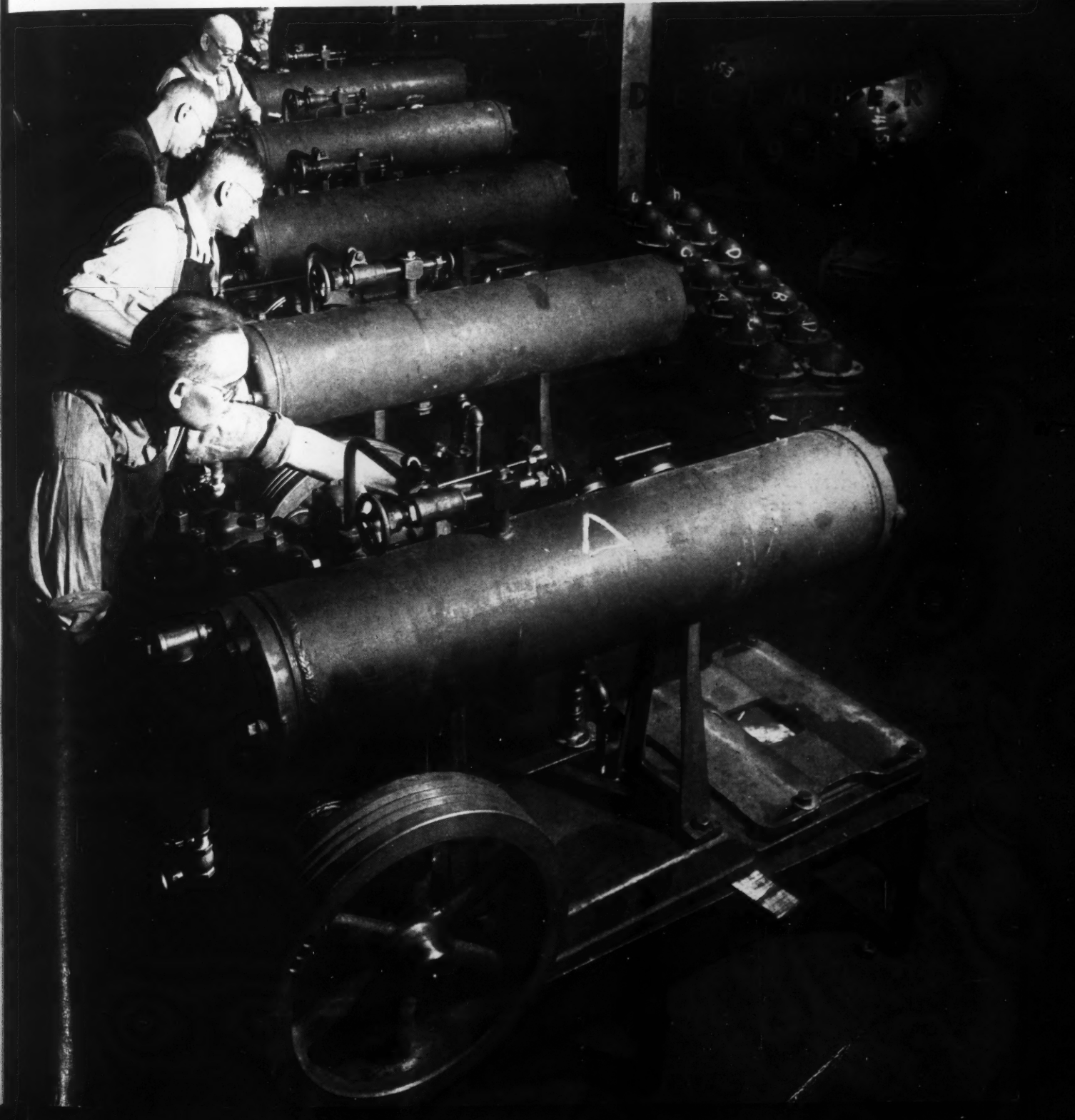

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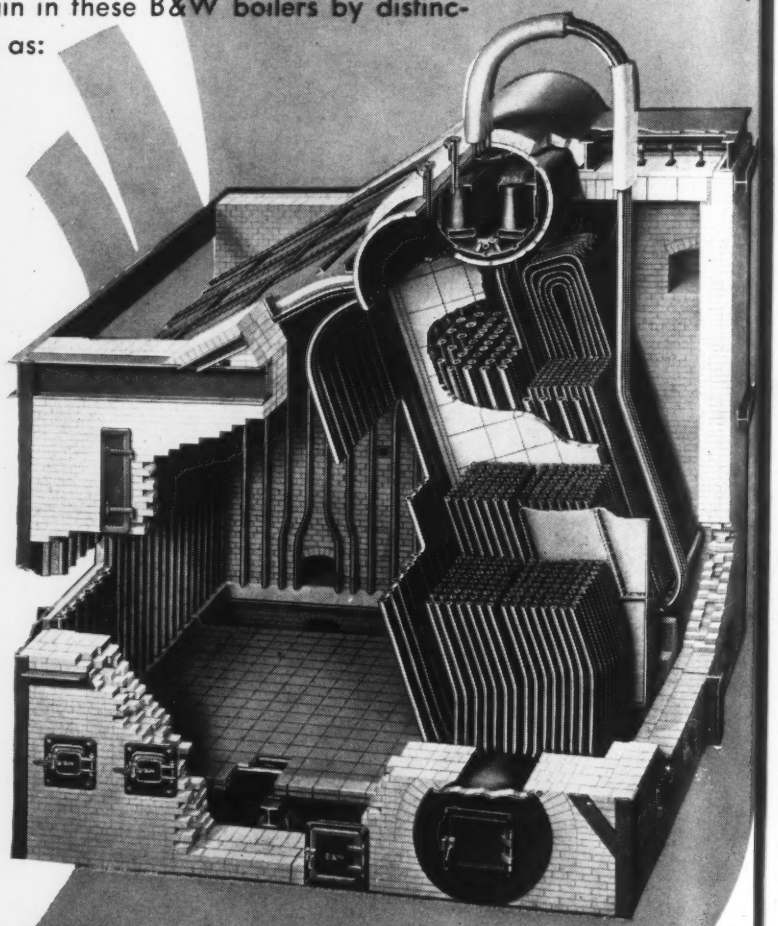

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MECHANICAL ENGINEERING

Published by The American Society of Mechanical Engineers

VOLUME 66 NUMBER 12

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Published monthly by The American Society of Mechanical Engineers. Publication office at 20th and Northampton Streets, Easton, Pa. Editorial and Advertising departments at the headquarters of the Society, 29 West Thirty-Ninth Street, New York 18, N. Y. Cable address, "Dynamic," New York. Price 75 cents a copy, $6.00 a year; to members and affiliates, 50 cents a copy, $4.00 a year. Postage outside of the United States of America, $1.50 additional. Changes of address must be received at Society headquarters two weeks before they are to be effective on the mailing list. Please send old as well as new address. . . . By-Law: The Society shall not be responsible for statements or opinions advanced in papers or . . . printed in its publications (B13, Par. 4). . . . Entered as second-class matter at the Post Office at Easton, Pa., under the Act of March 3, 1879. . . . Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized on January 17, 1921. . . . Copyrighted, 1944, by The American Society of Mechanical Engineers. Member of the Audit Bureau of Circulations. Reprints from this publication may be made on condition that full credit be given MECHANICAL ENGINEERING and the author, and that date of publication be stated.

Courtesy Buick

M-18 Tank Destroyer

(The M-18, a high-speed, heavy-fire-power tank destroyer, is capable of speeds of 55 miles an hour. It mounts a high-velocity 76-mm cannon which can knock out enemy tanks point-blank at several thousand yards.)

VOLUME 66
No. 12

MECHANICAL ENGINEERING

DECEMBER
1944

GEORGE A. STETSON, *Editor*

Digest for China

AT the urgent request of Paul Eaton, member A.S.M.E., who was at that time in China, the engineering societies, through our Department of State, provided copies of their publications for transmission, in the form of microfilms, to the engineers of China. By means of the microfilm the pages of MECHANICAL ENGINEERING and Transactions for an entire year can be put into an unbelievably small package and transported to China by air. In China the films are projected on screens before audiences of Chinese engineers who are, because of the war, cut off from the usual form of publications engineers in this country have in such abundance.

Another means of circulating engineering literature among Chinese engineers is the *Universal Engineering Digest*, published monthly in this country by the Universal Trading Corporation, official purchasing agency of the Chinese Government in the United States.

Material for the *Digest* is prepared by Chinese engineers in this country as an extracurricular activity and is supplemented by articles describing engineering projects and American industries. The *Digest* is printed on bible paper to reduce its weight. There are no advertisements. A 28-page issue can be sent to China via air mail for $2 a copy. About 300 copies are so distributed every month to governmental agencies in China and to industrial executives and engineers. Credit is given to original sources; and publications in this country, including those of The American Society of Mechanical Engineers, are co-operating by the loan of cuts.

For Balanced Education

EVIDENCE accumulates that the war is having a profound effect on education of all types and at all age and intelligence levels. Particularly does it serve to bring into sharp contrast the philosophies of education of those who advocate a pronounced vocationalism on the one hand and those who find broader and greater moral values in liberal-arts or "cultural" studies on the other. That advocates of either extreme should attempt to exclude or belittle the value of what the other has to offer without a thorough and sympathetic understanding of purposes and ideals is certainly to be deplored. What the postwar world needs, as most of us will agree, is a high productivity that will maintain a high level of employment, combined with a will to live peaceably with our neighbors, which must be rooted and sustained in a philosophy of living rich in moral values. Vocationalism and the materialism of science are likely to provide the means by which high productivity can be secured; but the war and the events leading up to it have shown that these alone are not enough, just as truly as history has proved that high moral purpose and nonmaterialistic culture are inadequate substitutes to offer the great masses of people who demand food, clothes, shelter, reasonably good health, and the opportunity to improve the lot of their children in an atmosphere of liberty and tolerance.

To the credit of engineers and scientists it may be said that they are approaching the problem of education with an appreciation of the values that are to be derived by enriching the knowledge which they must have of the fundamentals, upon which the practice of their profession is based, with studies in nontechnical fields that are necessary for an understanding of their relationship to society and the problem of living. For example, there has been published in MECHANICAL ENGINEERING (June, 1944) the report of the S.P.E.E. on "Engineering Education After the War" which advocates curricula based on the collateral stems of technical and social-humanistic studies, so clearly set forth in a previous report on Aims and Scope. References to both reports appear frequently enough to indicate that the dual background is thoroughly recognized and approved and has become a fundamental principle with engineers and engineering educators. Both reports were mentioned many times at the recent annual meeting of E.C.P.D., reported in this issue. Dr. Brown, in the dinner address on that occasion, and Messrs. Young, Burpee, and Davies who discussed his address, showed convincingly how liberalization of engineering curricula is regarded by leaders of the profession in the schools, in industry, and in engineering societies.

As Director Burdell of Cooper Union points out in his excellent report for the year, advocates of liberal-arts courses have been greatly concerned over the vocationalization of education as a result of the needs of the Army and Navy for trained specialists. No intelligent person would wish to see the teaching of the liberal arts permanently eclipsed by a swing of the pendulum too far in the direction of overemphasis on materialism and vocationalism. But if the scientist, the engineer, and the technician, so essential in modern civilization, have had the wisdom to broaden and liberalize the studies they believe the youth who enter these fields should undergo, it would seem that corresponding attempts on the part of the advocates of liberal-arts courses to broaden their understanding of science and technology would increase their value as citizens of the world that is to be.

Not only in this country (and Canada, as Dean Young testified at the E.C.P.D. dinner) but in Great Britain also are men who follow science and technology talking about education. A recent report of the British Association for the Advancement of Science deals thoroughly and

critically with this problem as it exists in Great Britain. Because of national and traditional differences, much of the report does not apply in this country. However, it will be noted that the same liberalization of the education of scientists and engineers that has created so much discussion in this country is to be found the subject of many passages of the B.A.A.S. report. Engineers and educators in the United States will find much in the report to excite their interest and enlarge their understanding of educational problems in Great Britain.

The time has long since passed when it has been necessary to "sell" education, either liberal or vocational. What concerns the present generation are such questions as the content and extent of curricula designed to prepare men and women for making their way in the world and accommodating themselves to the ways of the world; the extent of the opportunities that should be offered for "higher" education; the proper balance to be maintained between depth and breadth, between vocationalism and culture; and the amount and sources of money to be expended on educational programs. These problems greatly concern the future of our country. It is fortunate that engineers are alive to them and that in the areas which affect the education of the men who will take their places, they are showing wisdom and foresight.

Worker for Unity

THE retirement of C. F. Scott from the Committee on Professional Recognition of the E.C.P.D. should not be permitted to pass without comment. Assuming chairmanship of this committee at a time when direct approach to its problems and early realization of its principal objectives had bogged down, Professor Scott sensed the importance of the time element in maturing opinion, set new tasks for the committee to perform, and exhibited an unusual combination of zeal, industry, and patience in preparing foundations on which to build for the future.

One of the original objectives of E.C.P.D., for the attainment of which the Committee on Professional Recognition was organized, was "to develop methods whereby those engineers who have met suitable standards may receive corresponding professional recognition." During the early years of its existence the committee urged action relating to the adoption of the "minimum definition of an engineer," conformity to proposed standard grades of engineering-society membership, uniformity in new registration laws, and simplification and uniformity in engineering-school degrees. The traditions, procedures, and prerogatives of many organizations were directly affected by the proposals of the committee and it was only natural that progress toward the uniformity desired in establishing criteria of recognition was slow.

Refusing to be discouraged, Professor Scott turned back to fundamentals and wrote, in the committee's report for the first year of his chairmanship: "The societies might profitably crystallize more definitely their ideas of the profession, comparing their ideals and emphasizing what is common, rather than differences. They may well inquire how much the unity and the solidarity of the profession of which they have been the sponsors has suffered through their individual disregard of conformity; and they may also consider what action is expedient for the future." He seized upon the cardinal principle that if engineering students were thoroughly imbued with the ideals, opportunities, and obligations of an engineering profession they would develop into practicing engineers possessing an understanding of these matters which would provide fertile ground for the cultivation of unity and joint action. Naturally, the place to begin was with the engineering schools, through their deans and faculty members. For six years Professor Scott stuck to this task, with the aid of the student branches of the engineering societies, the S.P.E.E., and anyone who would warm to the task. He distributed thousands of copies of Wickenden's "Second Mile," that practical and helpful tract on professional-mindedness, and persuaded the author to revise and supplement it for the benefit of the young engineer. As R. E. Doherty said in his presidential report to E.C.P.D. a year ago, "I dare say that there are few engineers and engineering students on whom the force of Professor Scott's crusade has not had an effect."

Time will tell how soon and how thoroughly professional-mindedness and professional unity will become recognized characteristics of engineering. When that time comes it will be impossible to assess Professor Scott's contribution to it; but many a future engineer, whether he knows it or not, will owe to Professor Scott's missionary zeal the foundation of his concept of a profession.

Impact of Change

POSTWAR America will be more decidedly industrial than prewar America was, for by no other means can a high level of employment and a more broadly based standard of living be attained. Moreover, the industrial pattern of life becomes more pronounced the world over with the result that not only are grave social and economic problems forced upon most nations, with violence done to customs and traditions and concepts of personal, community, and national rights, but these problems are complicated in our own case by competition which forces us either to maintain our position or to surrender it to some other group or nation. We face the grave danger of underestimating how easily our advantage can be lost, not by sharing it with others but by attempting to spread it too thinly in securing blessings for all our people. Rights entail obligations, whether the form of society be feudal or industrial.

Development of the fruits of research accustom the minds of industrialists to almost constant change. Engineers, for example, find it hard to inderstand why some workers object to the introduction of labor-saving machinery and to "efficiency" in production. Yet the impact of change in other areas, economic and social, finds many engineers and industrialists just as fearful and just as stubborn as those who work for them. Man's progress through the ages has been measured by his control of his environment. Science and education have served valiantly where the physical environment was concerned. They must be brought equally to serve in the conquest of their social and economic environment.

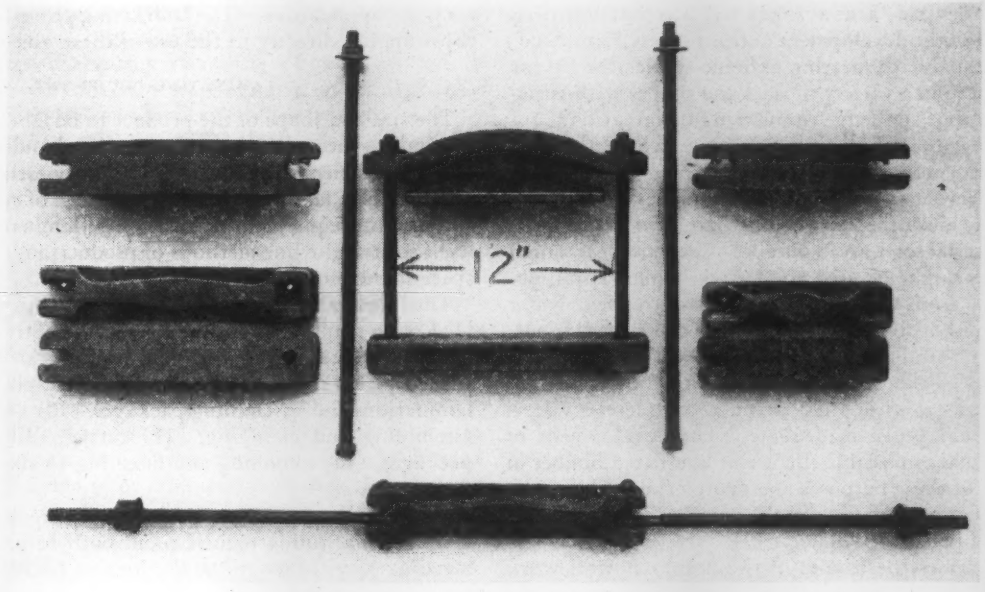


FIG. 1 FRAME CLAMPS USED IN LAMINATING TIMBERS

Laminating LUMBER *for Extreme* SERVICE CONDITIONS[1]

By C. D. DOSKER[2] and A. C. KNAUSS[3]

WHEN a nation is fighting a war, particularly a global war, enormous quantities of heavy timbers are required to meet military and industrial needs. To obtain these timbers in a seasoned condition is a practical impossibility; seasoning of heavy timbers is a time-consuming process. Even if the kiln-drying of heavy timbers were feasible, the nation's dry-kiln capacity would simply not be sufficient to meet this and other needs.

Laminating often provides a satisfactory answer to this procurement problem, for, by laminating, standard thicknesses of dry lumber can be built up into structural members. In comparison with solid timbers, laminated lumber offers a number of advantages. Solid timbers in large sizes inevitably contain some visible defects and may contain hidden defects, whereas laminated timbers need admit only such defects as are compatible with the use intended. Well-made laminated timbers are free from seasoning checks and shrinkage stresses and can be formed in curved or flat members in a wide range of cross-sectional sizes and lengths. Lumber of various species may be combined in them, with each utilized for its particular mechanical properties.

Until recently, however, laminated products could be used satisfactorily only where the glue joints were afforded reasonable protection from the elements. Casein glues had been proved suitable for such laminating purposes long before the war, and as steel became critical many structures, both military and industrial, were erected of laminated timbers that could be supplied in long lengths and large cross sections. There was still an urgent need, however, for laminated timbers made from lumber with glues durable enough to provide joints that could serve in outdoor exposure without protection from rain and sunshine and could withstand prolonged immersion in either salt or fresh water. These requirements called for a degree of water resistance that could not be produced with casein glues in laminated timbers at the outset of the war. If the same high resistance to moisture that had been developed in phenolic-resin glue joints in hot-pressed plywood could be obtained in glue joints in laminated-lumber products, it was felt that these requirements could be met.

Particularly urgent was the Navy need for white-oak timbers for boatbuilding. Gamble Bros., Inc., began working on this problem in mid-1942, in close collaboration with the Forest Products Laboratory which was already working on similar studies for the Navy Bureau of Ships. Sufficient progress toward meeting this critical wartime need had been made by January, 1943, to encourage the Office of Production Research and Development of the War Production Board to arrange with the Laboratory and Gamble Bros., Inc., to develop, if possible, a simple process of laminating, from white oak lumber, timbers suitable for ship stems, keels, and frames with glues that would provide strong and durable joints even when subjected to extreme service conditions. Particular emphasis was placed on the necessity of developing a laminating process that could be readily applied to existing plant facilities. It was anticipated that, if a satisfactory process could be worked out for the denser hardwoods, it could easily be applied to the softwood species.

[1] Acknowledgment is made to the Navy Bureau of Ships and the Office of Production Research and Development of the War Production Board for making possible the research program upon which this paper is based.

[2] Vice-President, Gamble Bros., Inc., Louisville, Ky.

[3] Technologist, Forest Products Laboratory, Madison, Wis. This laboratory is maintained by the Forest Service, U. S. Department of Agriculture in co-operation with the University of Wisconsin.

Contributed by the Wood Industries Division and presented at the Annual Meeting, New York, N. Y., Nov. 27–Dec. 1, 1944, of The American Society of Mechanical Engineers.

By the process devised, a new structural material has been born. As a result of the development of this process, laminated-timber products capable of meeting extreme service conditions can now be produced in a variety of sizes and shapes with structural possibilities that challenge engineering imagination.

What are the conditions of extreme service which the glue joints in laminated products heretofore have not been able to meet? Extreme service would naturally include severe exposure to moisture, heat, and other conditions that would affect the use of a given material for a given purpose. Purposes for which laminated timbers might be used are derrick booms, spars, observation towers, highway bridges, railroad trestles, water tanks, dock and harbor structures, and wood vessels of all kinds, including barges. Timbers subjected to these types of usage would of necessity be exposed to conditions in which laminated lumber glued with anything less than a completely water-resistant glue would prove inadequate. The development of this new process makes possible the use of laminated lumber in large sizes for all of these purposes and many others where adequate decay resistance is inherent in the wood or is provided by the application of preservatives.

This paper describes the results of the developmental work and the process by which, for more than a year, commercial quantities of critical items, largely for marine use, have been produced by lamination. There has been no report to date of any performance failure of the glue joint in more than a million board feet of material fabricated under the process.

GLUES FOR LAMINATING

While urea resin as well as casein glues have been used successfully for laminating large timbers from dry lumber, they do not provide the water resistance required to produce glue joints that are durable and resistant to delamination in white oak timbers when used for shipbuilding or for purposes that involve exposure to alternate wetting and drying in outdoor weather.

Glue joints with satisfactory water resistance for these extreme service conditions could be obtained with the hot-press phenol-formaldehyde resins, but these glues require considerable heat for curing. Temperatures of 240 F and higher are needed, and the successful use of these resins over a period of years has been confined largely to the manufacture of hot-pressed waterproof plywood. It has not been practical to produce such temperatures in laminated timbers of large size, and the process of laminating has not made use of these glues extensively.

More recently, phenolic-resin glues that employ special hardeners or catalysts to accelerate curing and thereby require less heating, have appeared on the market. In contrast to hot-press phenolic resins, these glues, described as low-temperature-setting phenolic resins, require heating variously from 90 F to 190 F, for periods of several hours to produce strong glue joints in wood. These low-temperature phenolic resins are essentially similar to the hot-press phenolic-resin glues, and when fully cured they possess the water-resistant qualities characteristic of phenolic-resin adhesives. They are not yet produced in great quantity, are several times more costly than casein or urea-resin glues, and have been used and tested for only a short period of time. They have already shown that, when cured, they are immune to attack by fungi and molds, are highly resistant to attack from chemicals that do not damage the wood itself, and are noninflammable.

Two other types of low-temperature-setting glue that possess similar characteristics have been developed recently. These are the melamine-formaldehyde resins and the resorcinol-formaldehyde resins. Some low-temperature glues are mixtures of phenol and resorcinol resins. These low-temperature-setting glues are furnished generally in water solution, although some of them use alcohol as a solvent. Their prices at present range from about 30 cents to 75 cents per pound in liquid form ready for application. The laminating process described in this paper applies directly to the use of these glues.

LAMINATING EQUIPMENT

The size and shape of the product to be fabricated will partly determine space requirements as well as handling methods best suited to efficient production. The daily estimated production will also be a factor in the determination of space requirements and machine equipment needed. The laminating process lends itself to straight-line methods of production, and long working space is therefore desirable.

The fabricating operations can be listed in detail as follows: (1) Rough planing, (2) ripping, (3) cross-cutting, (4) inspection of strips, (5) edge-gluing, (6) machining scarf joints, (7) gluing scarfed pieces into laminations, (8) finish-planing, (9) sorting laminations and assembling packages, (10) spreading glue, (11) assembling and clamping, (12) curing, (13) breaking down packages, (14) trimming and finishing to size, (15) inspecting and shipping.

Of these 15 operations the finish-planing, spreading of glue, and final machining require room both before and behind the machine equal in length to the longest timbers to be made.

Roller beds and electric hoists have been found essential to effective operation. Because some laminated assemblies weigh many hundreds of pounds, mechanical aids are essential.

Most of the equipment necessary for this process of laminating will usually be found available in a well-equipped woodworking plant. There are a few special items. It is assumed that the plant either has satisfactory dry kilns of modern design or an available source of sufficiently dry lumber, as well as heated facilities for the proper storage of dry lumber. The machines and equipment necessary are as follows: (1) Roughing planer, (2) vertical resaw, (3) cutoff saw, (4) straight-line rip saw, (5) edge-gluing equipment, (6) scarfing equipment, (7) finish planer, (8) cold storage for glue, (9) glue mixer, (10) glue spreader, (11) clamping beds and frame clamps, (12) curing chamber, (13) finishing equipment (four-side matcher or molder).

The band resaw is essential if curved laminated timbers are to be fabricated, in order to reduce lumber to the thinner thicknesses that may be necessary to accommodate the safe bending radii of the individual laminations.

Edge-gluing equipment, such as bar clamps, piling clamps, and, for shorter timbers, the caterpillar-type clamp carrier, is necessary. Usually, however, glue-curing requirements are such that either bar clamps or piling clamps would be preferable.

There are numerous ways of machining scarf joints. They may be cut on a saw, planer, shaper, single-end tenoner, or on specially designed machines. Scarfing, as will be noted in the subsequent discussion, is an extremely important part of this process and good transverse joints are essential.

The finish planer is probably the most important machine in the entire operation. This should be not less than a 6-roll ball-bearing double cabinet surfacer that is capable of surfacing to very close tolerances, but an 8-roll surfacer is to be preferred.

Clamping beds and frame clamps are special equipment and would not be available in the average woodworking plant. There are many ways of applying pressure to a package of laminated material. After experimenting with many methods, a simple frame clamp, readily adjustable for different depths, with an equalizing head for distributing pressure transversely, has been found the most satisfactory means of applying uniform pressure, Fig. 1.

The clamping beds, jigs, and fixtures necessary will to a large extent depend upon the type of production. In a shop, flexibility of equipment is required. The clamp beds, which were designed for fabricating flat timbers, are of channel-iron construction mounted on four casters. These beds are approximately 5 ft wide and 11 ft 6 in. long and are so designed

that they can be used as single units or can be joined endwise and used in multiple lengths, Fig. 2. These beds in single lengths will enter the curing chambers either crosswise or lengthwise. Curved timbers were laminated in an adjustable jig, Fig. 3, in which I-beam spanners can be set to the curve required in the finished product. This jig is adjustable to any angle between 90 deg and 180 deg. Draw-up clamps are used to tie the package directly to the bed.

Vertical clamping has been found desirable, since it permits full view of both edges of the package while pressure is applied.

The glue is cured by heating the laminated assembly in a curing chamber. A well-constructed dry-kiln building, designed to retain high humidities, supplied with steam-heating coils and sprays for temperature and humidity control, and with fans to insure ample circulation of air to maintain uniform temperature in all parts of the curing chamber was used for this purpose. Dry- and wet-bulb automatic recording controllers are quite essential to the operation of curing chambers. Finely divided water sprays were found to be more practical than steam sprays to provide controlled high humidities during the cooling period.

Potentiometers and thermocouples have been used to advantage in measuring the temperatures attained within the glue lines at various stations in the laminated beams. While these were not used to control the curing-chamber conditions, they were extremely helpful in developing curing-time schedules, particularly when making up members of new cross-sectional dimensions.

SELECTION AND PREPARATION OF LUMBER

At the outset of the studies, individual white-oak laminations were limited to 1 in. or less in thickness, as sufficient testing had not been done with the laminating of thicker stock to determine whether lamination thickness would have any effect on the reliability of the glue bond. The results of tests now show that laminations of greater thickness may be used in flat members without disadvantage. Thick lumber, however, is difficult to season uniformly, and the availability of properly seasoned stock will be a factor governing the use of laminations greater than 1 in. thick.

In a curved laminated member, however, the selection of the thickness will depend upon the minimum radius to which the dry lumber may be bent without breaking. Clear lumber can usually be bent without breaking to a radius that is 40 to 100 times its thickness, depending upon the species of wood. In general, hardwoods can be bent to somewhat shorter radii than can softwoods of the same thickness. In Table 1, minimum safe bending radii, arbitrarily specified as 1.6 times the average actual breaking radii, are shown for white oak and Douglas fir of the quality required for ship timbers.

TABLE 1 MINIMUM SAFE BENDING RADII FOR WHITE OAK AND DOUGLAS FIR

White oak		Douglas fir	
Lamination thickness, in.	Minimum bending radius, in.	Lamination thickness, in.	Minimum bending radius, in.
1/4	18	1/4	31
5/16	24	5/16	41
3/8	30	3/8	51
7/16	36	7/16	63
1/2	43	1/2	74
5/8	58	5/8	98
3/4	73	3/4	125
13/16	79	13/16	137
		1	180

NOTE: Minimum safe bending radii shown for white oak are for continuous solid laminated members and scarfed members are normally bent to a radius which is less severe.

In determining the thickness of stock for laminating curved members, Table 1 applies to laminations containing well-made scarf joints as well as to unscarfed lumber. It may often be desirable to use thinner laminations than are indicated in the table in order to bend the stock more easily to the desired form, and sometimes to obtain a greater yield of laminated timbers by resawing the available stock of lumber rather than planing directly to thin sizes.

FIG. 2 FLAT JIGS, MOUNTED ON CASTERS, FOR CLAMPING LAMINATED BOAT-SKEG ASSEMBLIES

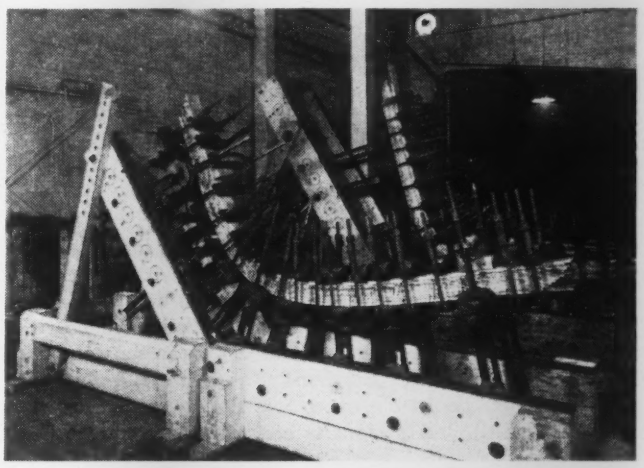


FIG. 3 CURVED LAMINATED ASSEMBLIES IN ADJUSTABLE JIGS

Highest-strength glue joints can be obtained with phenol, melamine, and resorcinol low-temperatrue-setting resins if the wood is glued at a moisture content between 8 and 15 per cent. Gluing wood at a moisture content below or above this range tends toward weaker joints, and gluing at a moisture content above 22 to 25 per cent produces joints that are much weaker.

It is desirable, however, that all the lumber used for any laminated assembly be at approximately the same moisture content at the time of gluing to avoid subsequent unequal shrinking or swelling of the laminations. The lumber used in the laminating studies was kiln-dried to a moisture-content range of 8 to 12 per cent and was relatively free from case-hardening. A moisture content averaging 10 per cent permits the glue to develop maximum strength of bond and is not likely to change seriously in the various operations in the plant while the laminating process is under way. It is desirable to laminate the assemblies at a moisture content as closely as practicable to the average moisture content subsequently attained in service.

In the selection and preparation of lumber for laminating, consideration should be given to all defects that may affect or impair the quality of either the glue bond or the finished product. To do this, one must know and consider several points, such as the strength requirements of the finished members;

the severity of the curvatures in curved members; the ultimate dimensions of the finished piece; the strength and durability that would be expected of the glue joints; and the risk of delamination at glue joints around areas containing knots.

One of the advantages of laminating is that the type and position of defects admitted can be controlled. The presence of large holes, knots, dote, wane, and similar defects would tend to decrease the strength of the laminated structure. The practice to date has been to eliminate most of these types of defects by cross-cutting or ripping. Knots in excess of $1^1/_4$ in. diam have been eliminated from the laminations to be used in flat members; and, in members with severe curvature, no knots larger than $^1/_4$ in. have been admitted, due to the tendency of wood with larger knots to break in bending.

It is difficult to plane lumber containing knots to the uniform thicknesses required for laminating purposes, and considerable testing will be required to determine the quality of glue joint that can be obtained in areas containing large knots.

Laminating, of course, cannot make nondurable species durable. Sapwood of any species is readily susceptible to wood-destroying fungi when used under certain moisture conditions. When placed in laminated assemblies, the decay of a single board may cause failure of an entire member, and the amount of sapwood or nondurable wood admitted should be controlled by the requirements of the finished structure.

There is no apparent reason why laminated timbers cannot be protected by suitable preservative treatment as are solid timbers, but this matter requires demonstration.

Plain- or flat-sawed lumber shrinks or swells at a different rate across the width of a board than quarter-sawed lumber. It is therefore desirable to segregate all lumber for laminating into groups, placing in one group all plain-sawed lumber having the annual rings parallel to or within 45 deg of the face. The second group would contain all lumber with annual rings from 45 deg to vertical, or quarter-sawed. Boards are classified according to the predominance of flat or vertical grain. This operation should be done prior to any edge- or scarf-gluing, to insure that all the laminations to be used in a single assembly are in the same group. It is also desirable to keep reasonable control over the uniformity of density of the wood entering into a single laminated assembly.

Straight-grain lumber is selected for laminating curved members, since excessively cross-grained wood will not safely bend to the radii indicated in Table 1. In flat members cross grain can be admitted to a larger extent in laminations used in the central portion of a beam than in the outer laminations. The use of the product will determine the degree of care which must be exercised to avoid grain deviation.

With the development of laminated timbers, engineered for definite strength, selection of lumber for straightness of grain, density, and types of defects will become increasingly important.

In listing the equipment necessary for laminating operations, the use of a rough planer was indicated as desirable for the first step in the preparation of lumber. The surfacing operation at this point will help disclose natural and seasoning defects and will exclude much wood unsuitable for laminating.

Whether material is first cross cut or ripped following planing is of little consequence. It is necessary to eliminate defects and to reduce stock to the necessary lengths as determined by the size of the laminated members to be fabricated. The narrowest piece that it is practical to edge-glue will probably be found to be $1^1/_2$ in. It has been found desirable, in using random-width hardwoods, to establish standard ripping widths, combinations of which will produce the desired widths. If softwood boards of standard width are purchased, a minimum of ripping is necessary.

The end-joining of lumber is primarily performed to obtain full-length laminations longer than standard lengths of lumber, as well as to utilize raw material more efficiently. Maximum strength of end joints can be realized only if these joints are prepared and glued in advance of final surfacing. This procedure makes it possible to plan in advance of the laminating operations the location of such joints among the laminations in the package. As long as it is necessary to control the location of end joints, the need for careful planning of production cannot be overemphasized. Advance joining also makes it possible to obtain uniform thickness of stock throughout the length of each lamination and avoids the variation in thickness that would develop at butt-jointed assemblies. With full-length laminations, spreading of the glue and laying up of the final assembly are simplified.

There are several accepted types of end joints. The common types are the V-scarf, finger, plain scarf, and serrated-scarf joint. The ultimate strength required of the finished member will determine the type of end joint to be used, but the shorter the joint, the greater is the raw-material saving that is obtained. There is need for developing new and shorter types of end joints that will produce adequate strength and conserve material.

All of the types of joints mentioned have been used in this work. The finger scarf through the face of the board and the serrated scarf with slope of 1 in 4 have performed satisfactorily in production to date. Serrated scarfs can be made with various types of serrations. These can be straight, shaped, or ovate, and have the advantage that they show little tendency to chip or peel when the lamination is surfaced. At the present time, the gluing of plain or serrated scarfs requires continuous clamping pressure. Some finger- and V-scarf joints are much simpler to glue as the only mechanical pressure required is that needed to assemble them; the joint itself furnishes gluing pressure.

The resorcinol resins being used for gluing end joints develop sufficient strength in 16 hr at temperatures of 80 to 90 F, to permit safe handling and machining and are, of course, completely cured by the heating of the final assembly.

Various types of operations have been contemplated and many tried in an effort to improve the mechanization of the gluing of end joints. It is to be hoped that the use of high-frequency electrical heating, for example, may help to break this bottleneck in production and permit progressive gluing at high speed.

Edge-gluing does not present a serious problem. Piling clamps have generally been used because they permit the edge-gluing of long lengths and conserve space. The revolving type of clamp carrier can be used to advantage on short stock provided that artificial heat is available. Stock for edge-gluing has been satisfactorily prepared on a straight-line ripsaw. Saws were kept true and sharp and in joint to obtain sawed joints adequate for this work. The glue is spread on both edges forming glued joints. In laying in the clamps, wide strips are placed next to the clamp jaws. Pressure is applied progressively from the center toward the ends or from one end to the other and is maintained until the glue joint develops sufficient strength to permit safe handling. Further cure is accomplished by heating the final assembly.

When lumber is resawed after edge-gluing and end-joining in preparation for use in curved members, the material should be lightly surfaced before resawing to remove surplus glue from the faces. In this way, reasonably smooth surfaces are presented for final machining, and skips in dressing that might otherwise develop due to irregularities in the surfaces are avoided.

The operation of resawing lumber into thin material, especially in material more than 6 in. wide, will demonstrate how well the lumber has been dried. If the lumber is case-hardened or not uniformly dry, cupping is almost inevitable. In the final surfacing immediately following the resawing, the heavier cut should be taken from the original outer surface, thus relieving stresses and holding the material as flat as possible. Cupping is a serious problem in laminating material, as the pressure that must be exerted to flatten the boards will not be fully effective

as gluing pressure. Cup in boards after surfacing has been restricted to $^1/_{32}$ in. for each 1 in. in width for boards $^1/_2$ in. and less in thickness; and $^1/_{64}$ in. per in. of width for boards more than $^1/_2$ in. in thickness. Cupping not only affects the application of pressure, but it also makes uniform spreading of glue difficult.

The final surfacing for laminating is probably the most important operation in the entire procedure. In order to produce satisfactory glue joints, the maximum variation in thickness in any individual lamination has been restricted to 0.01 in. To do this job properly, a double cabinet surfacer with ball-bearing cutter heads is required. The question is often asked, "How can one possibly maintain tolerances of ±0.005 in. in surfacing?" This is not difficult to accomplish provided that the planer is in first-class operating condition. Much lack of uniformity in surfacing can be traced directly to the condition of the machine.

The bedplates, pressure bars, and rolls must be true. Knives must be sharp and properly set to the cutting circle, and the cutting angle must be adjusted for the species of wood to be surfaced. The final cut should be very light, not exceeding $^1/_{16}$ in. from each surface. Matchers and molders do not hold the accuracy of adjustment necessary for the proper surfacing of stock for laminating, and their use is not recommended for this purpose. Rates of feed from 30 to 60 fpm and from 20 to 30 knife cuts per in. have been found to produce smooth surfaces. If the surfacing job is well done, the revolution marks are hardly perceptible. Frequent measuring of stock with slip-on thickness gages greatly aids accuracy. These gages should be not less than $^3/_4$ in. in width to prevent rocking on the stock.

The location of end joints in a laminated structure is of considerable importance. Well-glued scarf joints do not develop maximum strength except with long slopes such as 1 in 12 or more. By and large, the more abrupt the slope, the weaker is the bond. Therefore, end joints of the relatively short type used commercially cannot be concentrated without seriously weakening the laminated timber, and their location must be controlled. In general, such scarf joints have been satisfactorily used with a spacing of not less than 24 times the thickness of a lamination (measured center to center) in any group of three consecutive laminations. A practical equivalent rule of thumb is that, in any group of three consecutive laminations, no scarf joints shall be closer than 12 in. center to center in stock $^1/_2$ in. or less in thickness, and none closer than 18 in. in thicker stock up to $^{13}/_{16}$ in. in thickness. Future testing must be relied upon to determine the most practical spacing of scarfs.

Edge joints in themselves do not materially reduce the strength of the stock used in laminating. It is desirable, however, to avoid placing edge joints above each other in adjacent laminations; they should be separated by at least the thickness of a lamination. In preparing laminations, it is desirable to end-join strips in which the edge joints are in line.

Flat members are laminated on forms or jigs that have a flat steel bar or channel section for a bed or bottom caul. The beds are straight and are provided with guides for edge alignment. The cured assembly retains the form of the bed, and any misalignment results in a permanent crook or warp which cannot be removed except by machining.

Curved members can be laminated on either male or female forms and jigs. Adjustable universal jigs can easily be fitted and set to light plywood templates cut to the desired curvature. Glued laminated assemblies cured in the jig retain the curvature so closely, Fig. 4, that no correction for spring-back is necessary in the original setting of the jig, but, when the clamped assembly is cured after removal from the jig, slight spring-back develops, and the jig is set up to include a slight correction.

PREPARATION OF GLUE

Although phenol, melamine, and resorcinol low-temperature resins require considerable heating after being mixed with

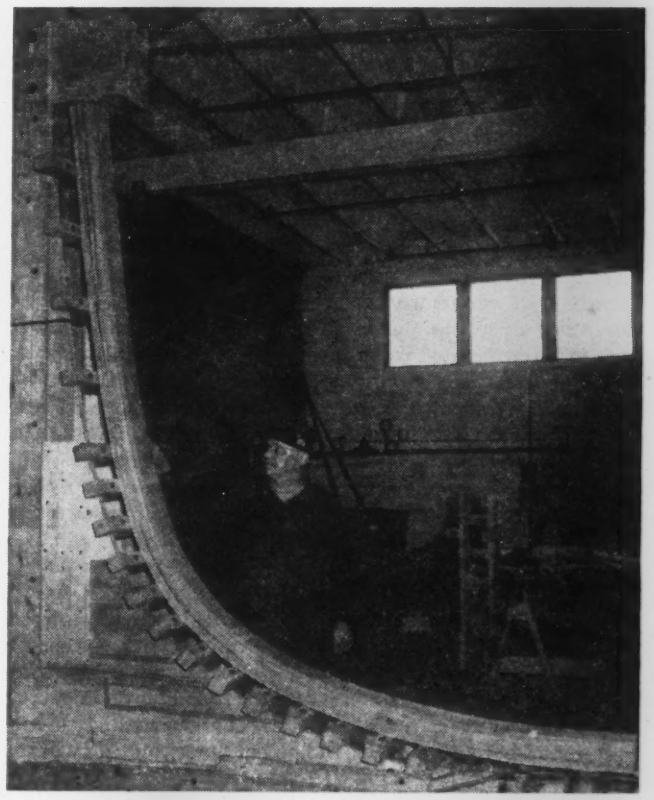


FIG. 4 CURVED LAMINATED BOAT FRAME PLACED IN JIG AFTER CURING TO SHOW THAT ORIGINAL CURVATURE IS RETAINED

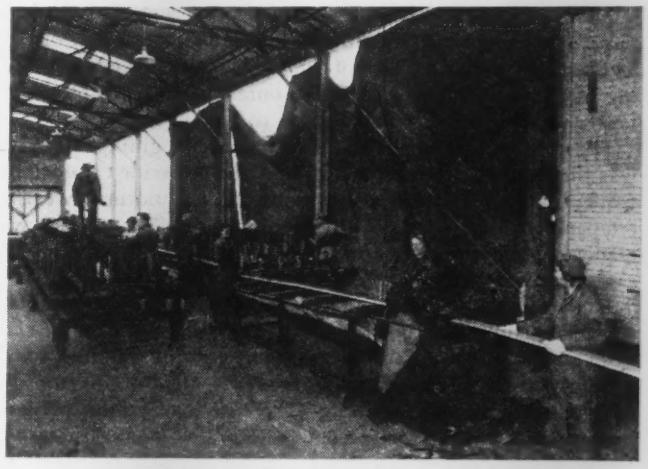


FIG. 5 GLUE-SPREADING AND CLAMPING OPERATIONS

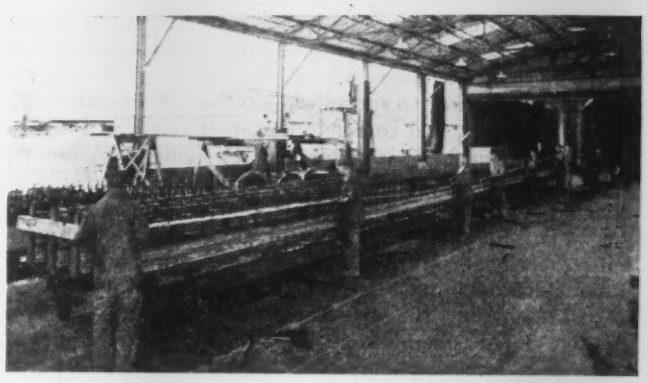


FIG. 6 LAMINATING 65-FOOT WHITE-OAK PT BOAT KEELS

the catalyst to develop strong glue joints, the unmixed resin will cure to some degree in normal room-temperature storage. Storage at 70 F or less prolongs the useful life of both the resin and hardener, except in the case of the resorcinol resins, which seem little affected by normal storage-room temperatures. The useful life of most of these glues is generally definitely limited even in cold storage, and the glues must be used within a few months after receipt, as designated by the glue manufacturer.

The catalyst or hardener is mixed with the resin just before it is used, in the proportions recommended by the glue manufacturer, and the mixture can be used over a period of several hours at ordinary room temperature, comparable in this respect with casein and urea-resin glue mixtures. Holding batches of mixed glue in a refrigerated room until they are needed extends this useful period. The mixing and spreading equipment must be thoroughly cleaned of all traces of other chemicals before it is used, to avoid contamination of any kind which would alter the composition of the glue. Likewise, it must be free of dirt, oil, grease, and other matter that would interfere with the glue bond. Commercial mechanical glue-mixing equipment is satisfactory for mixing the hardener with these resins, and steel, aluminum, or copper equipment can be used.

Although extenders or fillers are sometimes used to reduce the cost of glue spread, the glues employed in the research here described were used without the addition of filler, except that contained in the hardener as furnished by the glue manufacturer.

Shipments of glue as received from the glue manufacturer may show some variations in working characteristics, and it has been found helpful to check the pH and working-life values of each shipment before using the glue.

In the experiments upon which this development is based, the mixed liquid glue was spread on the laminations by passing them through a rubber-covered grooved double-roll spreader which deposited a thin layer of liquid glue on both faces of the lamination, Fig. 5. The glue was spread at a rate of about 60 lb per 1000 sq ft of glue-joint area, with about one half of that amount spread on each face of the lamination. Double-spreading of each lamination except the outer ones was employed to insure wetting of all wood surfaces to be glued.

The temperature of the room in which the gluing was done was that normal to the factory; heated to provide comfortable working conditions in cold weather, and normal weather temperatures up to 100 F at other seasons. No attempt was made to cool the room in hot weather. The lumber in all cases was at room temperature.

It is important, when using these glues, that the mixing and spreading equipment be cleaned regularly before the glue sets. Cold or lukewarm water is efficient for washing out most of the glue mixtures, but some glues furnished in alcohol solution also require alcohol in the washing water. The melamine glues do not wash readily with water, and the addition of acetic acid to the washing water is very beneficial. Hot water and steam are to be avoided as cleaning agents, since the heat is apt to cure the resin before it can be washed away. Once the glue has set and cured in the spreader, there is no method of washing which will remove it, and chipping or some other mechanical means must then be used.

The time required to spread the glue on all laminations, lay up the assembly, and complete the application of pressure is commonly defined as "assembly time." Some of the low-temperature phenolic-resin glues have been found to permit an assembly time of 2 to 3 hours, which in some cases has been necessary. This long period is an advantage compared to laminating with room-temperature-setting casein and urea glues, which provide maximum permissible closed assembly periods of only 30 to 45 min under the same assembly temperatures. The permissible closed assembly time of the low-temperature phenolic-resin glues decreases appreciably with higher glue-room and lumber temperatures, until at 100 F, it is considerably less than 1 hr.

After being spread with glue, the laminations are placed on the bed of the jig, one on another, in closed assembly, thus avoiding the exposure of freshly spread glue to the air, which would permit drying, Fig. 6. Each lamination is of the full length and width required for the finished product. A wood or metal caul is placed on the bed of the jig before the first lamination is placed, and another wood caul is placed on top of the last lamination laid down.

When laminating flat products, it is comparatively easy to follow immediately with the application of pressure by frame clamps. When laminating severely curved assemblies, the individual laminations are bent into approximate position as the assembly is laid up, with one end of each lamination set against a head block at one end of the jig, and the other end fastened to a tail block by nailing. When the lay-up is completed, the assembly is drawn into final curved position by draw-up clamps; the nailed end is cut away to permit slipping of the laminations, and the clamps are drawn tight. Gluing pressure is then applied by frame clamps, developing an average of about 150 psi on the glue-line area. Torque wrenches, calibrated by compressometers, are used to measure the pressure applied.

In curved assemblies, the frame clamps are tightened to full pressure first at the center of the curve, with subsequent clamping proceeding progressively toward each end to permit individual laminations to slip into place and form tightly fitting glue joints. Frame clamps with equalizing heads provide distribution of gluing pressure across the width of the assembly. Distribution of pressure along the assembly is provided by the caul boards, usually of the same species and thickness as used in the laminated assembly, but sometimes a steel caul has been used on the bottom. The ability of wood cauls to distribute clamping pressure varies with their thickness. Tests show that, in laminating oak assemblies, retaining clamps can satisfactorily be spaced up to 4 in. apart when the caul thickness is $^3/_8$ in., and that $^3/_4$-in. cauls produce equally good joints if the clear space between clamps does not exceed 9 in.

In the developmental work, clamped assemblies were often found to suffer some loss of gluing pressure within $^1/_2$ hr after clamping, and retightening was necessary. Under these clamping pressures and technique, the 60-lb glue spread applied to the laminations produced a definite and visible glue squeezeout. The placing of waxed paper between caul boards and laminated assembly and between superimposed assemblies prevented them from sticking together as a result of glue squeezeout.

Although the application of pressure by means of hydraulic equipment is used quite extensively in plywood and other gluing practice, such operations generally apply pressure simultaneously over the entire glue area and do not provide opportunity for the progressive application of pressure necessary to permit laminations to slip into position where curved assemblies are involved. Hydraulic equipment is also not generally adapted for operation at the temperatures required for curing these glues. Hence, attention has been directed in the developmental work toward the use of equalizing-head frame clamps.

CURING PHENOL, MELAMINE, AND RESORCINOL LOW-TEMPERATURE-SETTING RESIN GLUES IN LAMINATED CONSTRUCTION

Many low-temperature phenolic resins mixed with hardeners or catalysts will react and partially set at normal room temperatures, but in most cases additional heating is required to develop joint strength equal to that of the wood. Heating laminated assemblies to temperatures ranging from 90 F to 190 F, develops high joint strengths when using these glues, and it has generally been believed that, thus cured, the glue joints would compare favorably with the phenolic-resin glue joints in hot-pressed plywood which, over a number of years of testing and experience, have shown very high resistance to water immersion and outdoor exposure. The low-temperature-phenolic-resin glue joints also show excellent strength after boiling in water.

FIG. 8 EXPERIMENTAL LAMINATED BEAMS ON OUTDOOR EXPOSURE RACKS AT FOREST PRODUCTS LABORATORY

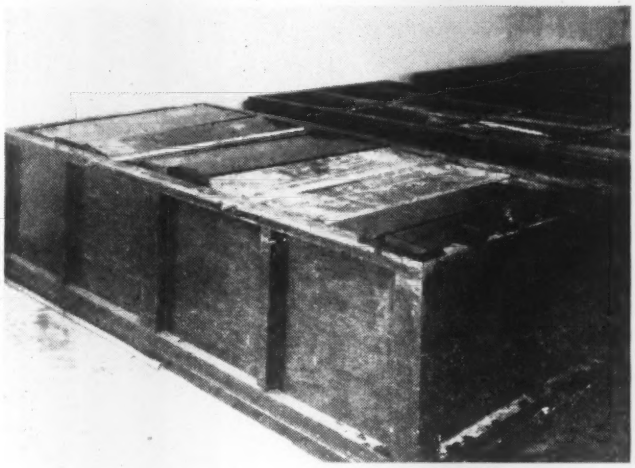


FIG. 7 EXPERIMENTAL LAMINATED BEAMS SOAKING IN SALT WATER TO DETERMINE GLUE JOINT DURABILITY

continuously in fresh water or in salt water, Fig. 7, when alternately soaked and dried, and when exposed to the weather, Fig. 8.

The results of shear tests (both dry and wet) on typical glue joints in white oak made with a low-temperature phenolic resin are shown in Table 2. These results show that good strength was developed when the joints were cured in a chamber maintained at a temperature of 110 F, but that higher strengths and wood failures were developed when curing-chamber temperatures of 160 F or more were used. The temperatures at the centers of the timbers, of course, were lower than the room temperatures during most of the heating period. These joint strengths were maintained without loss in specimens exposed to immersion in water and to outdoor weather for 12 months and dried again before testing. Shear tests on short beam sections immersed in 4 per cent salt water up to 12 months showed a normal decrease in strength for wet wood, but the glue joints maintained the original high percentages of wood failure. Both dry and wet-shear tests indicate that the low-temperature phenol-resin glue joints should not be damaged in exposure to water immersion or to outdoor weather.

TABLE 2 GLUE-JOINT SHEAR STRENGTH IN LAMINATED WHITE-OAK BEAMS GLUED WITH A LOW-TEMPERATURE-SETTING PHENOLIC RESIN[a]

Temperature of curing chamber, deg F	Length of heating period, hr	Dry shear tests[b]: After gluing — Psi	After gluing — Per cent wood failure	After 12 months' exposure to weather — Psi	After 12 months' exposure to weather — Per cent wood failure	After 12 months soaking in 4 per cent salt water and redried — Psi	After 12 months soaking in 4 per cent salt water and redried — Per cent wood failure
110	48	2180	38	2357	63	2811	95
160	24	2593	80	2836	87	3052	85
180	24	2708	87	2776	88	2703	93
210	24	2792	92	2826	92	2895	97

Temperature of curing chamber, deg F	Length of heating period, hr	Wet shear test after soaking in 4 per cent salt water: Soaking 1 month — Psi	Soaking 1 month — Per cent wood failure	Soaking 6 months — Psi	Soaking 6 months — Per cent wood failure	Soaking 12 months — Psi	Soaking 12 months — Per cent wood failure
160	22	2267	75	1621	77	1597	88	1560	90
190	28	2338	79	1678	91	1592	97	1483	95
210	14	2613	89	1929	92	1874	98	1714	98

[a] Each shear-test value is the average of 24 or more tests.
[b] Specimens tested at 12 per cent moisture content.

Before proceeding with the use of these low-temperature, phenolic-resin glues in laminating white-oak ship timbers, it was decided to test intensively the strength and quality of the glue joints and their resistance to delamination in service. Experimental white-oak beams were laminated and cured in a series of tests in which 15 low-temperature phenol, melamine, and resorcinol resin glues were used. Tests were made on the glue joints in these beams to determine their dry shear strength, their shear strength when soaked continuously in water, and their ability to resist delamination when soaked

It was observed, however, that when laminated white-oak beam specimens were subjected to outdoor exposure, glue-line delamination developed in numerous beams which had shown both high strength and wood failure in dry and wet shear tests. Fig. 9 shows the appearance of typical sections 2 in. long taken from laminated white-oak beams cured in chambers heated to 110, to 160, and at 210 F, and tested in repeated cycles of soaking (4 per cent salt water) and drying. Glue joints in beams cured at 110 F delaminated rapidly, and, although developing more slowly, some delamination took place in beams cured at 160 F.

Fig. 9(*A*)

Fig. 9(*B*)

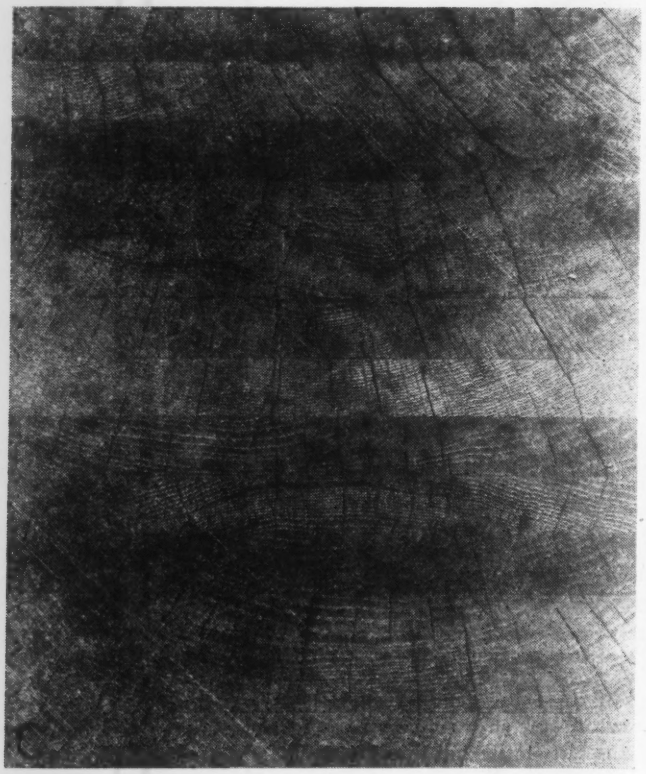


Fig. 9(*C*)

FIG. 9 EFFECT OF CURING TEMPERATURE ON RESISTANCE TO DELAMINATION IN WHITE-OAK BEAMS GLUED WITH A LOW-TEMPERATURE PHENOLIC RESIN

(Cross sections, 8 × 10 in. in size, are shown after alternate salt-water soaking and drying for about one year. Beam *A* cured at 110 F; beam *B* cured at 160 F; beam *C* cured at 210 F. Forest Products Laboratory.)

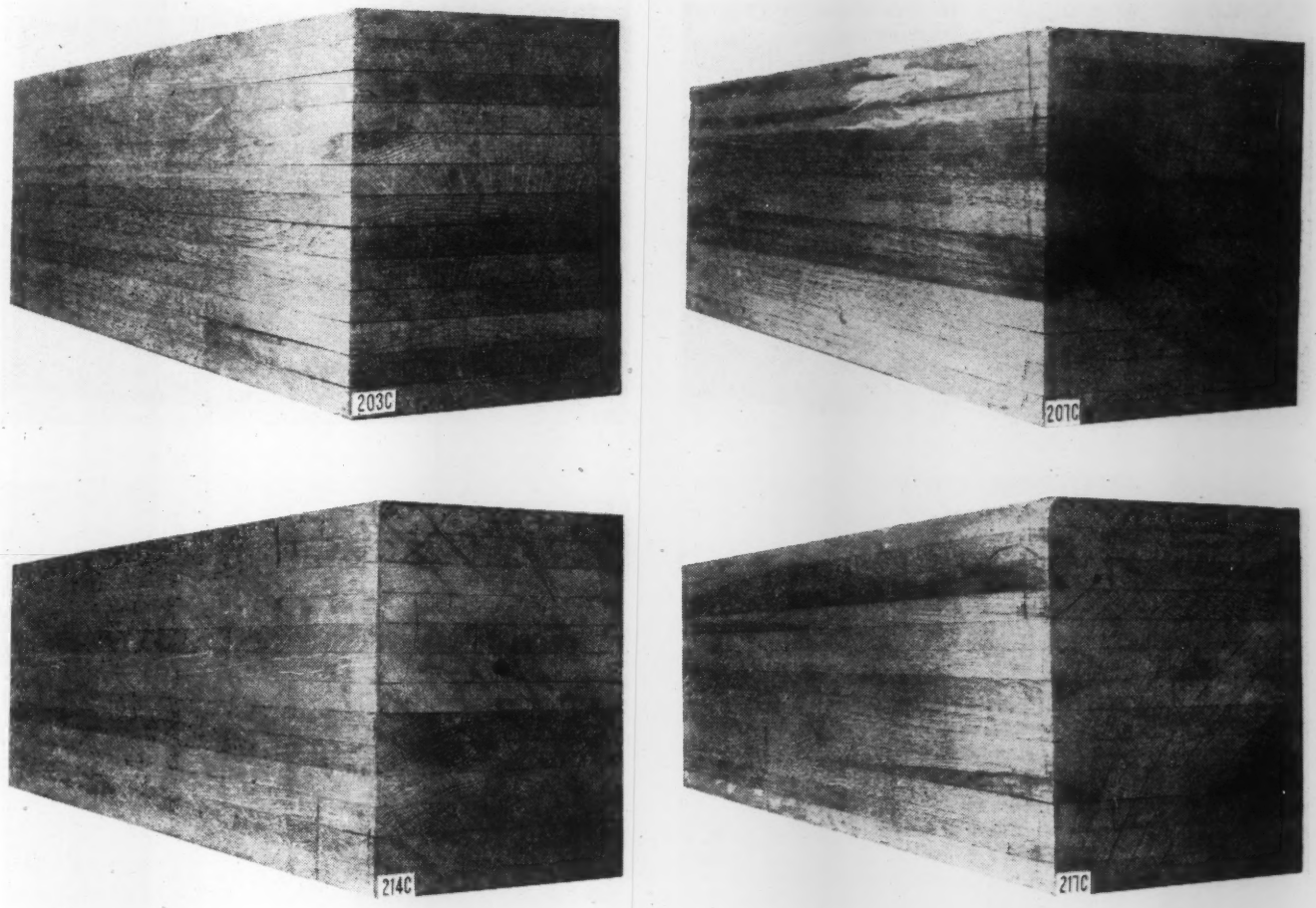


FIG. 10 EFFECT OF CURING TEMPERATURE ON RESISTANCE TO DELAMINATION IN WHITE-OAK BEAMS GLUED WITH LOW-TEMPERATURE PHENOLIC RESIN AND EXPOSED TO THE WEATHER WITHOUT PROTECTION FOR APPROXIMATELY 10 MONTHS
(Beam 203C cured at 110 F; beam 207C cured at 160 F; beam 214C cured at 180 F; beam 217C cured at 210 F.)

Beams cured at a chamber temperature of 210 F were practically free from delamination, and it was evident that a relatively high temperature of cure was necessary to develop glue joints that would resist delamination when subjected to extreme service conditions. Sections of laminated beams soaked in fresh water developed as much delamination as those which were soaked in salt water.

Full-sized white-oak beams cured at 110 F, and immersed continuously in 4 per cent salt water for 12 months developed slight delamination but those cured at 160 F and 210 F showed no delamination. Similar beams exposed to weathering, however, showed a tendency to delaminate like the short sections tested by repeated soaking and drying, Fig. 10. After nearly one year of exposure, beams cured at chamber temperature of 180 F and less showed sufficient delamination to indicate that they would not be satisfactory for many extreme exposure conditions.

Beams cured at a temperature of 210 F showed satisfactory glue joints in the same period of exposure.

This difference in delamination shown by white-oak beams, cured at different chamber temperatures, is not fully reflected by the glue-joint, shear-strength, and wood-failure values obtained from the same beams, and leads to the conclusion that, in selecting glues for laminating purposes, the glue joint should be required to develop high shear-strength and wood-failure values, tested both dry and wet, and should in addition demonstrate its ability to resist delamination under exposure conditions comparable to those experienced in service. A number of the phenolic-resin and melamine glues tested in white-oak beams showed the same general effect of satisfactory resistance to glue-joint delamination when cured in chambers heated at 210 F, as shown in Fig. 11.

When laminated assemblies are cured in heated chambers, the interior of the assembly does not fully reach the chamber temperature within a practical period of time. Curing white-oak units in a chamber heated to 210 F was found to heat the inner glue lines to 190 F or more, and the conclusion was reached that satisfactory cure of the glue joint in white-oak beams was accomplished if all glue-line areas were heated to 190 F or more for not less than 10 hr. Some of the low-temperature phenolic-resin glues tested, however, failed to produce glue joints resistant to delamination even when cured at 190 F (measured at the glue line), as just indicated, and were not considered acceptable for laminating ship timbers under this process.

Some resorcinol glues were found to produce joints in white oak that would resist delamination equally well when cured at 140 F (measured at the glue line) for 10 hr. When laminating Douglas fir and shortleaf-pine lumber into timbers with the same glues, it was found that less heating is necessary than in white-oak beams to develop joints which will resist delamination. Several low-temperature phenolic-resin and melamine glues require a minimum temperature (measured at the glue line) of 160 F for 10 hr, when laminating shortleaf pine; and 140 F for 10 hr when laminating Douglas fir. Some resorcinol glues can be used equally satisfactorily with shortleaf pine when the glue line is heated at 110 F for 10 hours, and with Douglas fir when the glue line is heated at 80 F for an equal period.

Some low-temperature phenolic-resin glues tested used

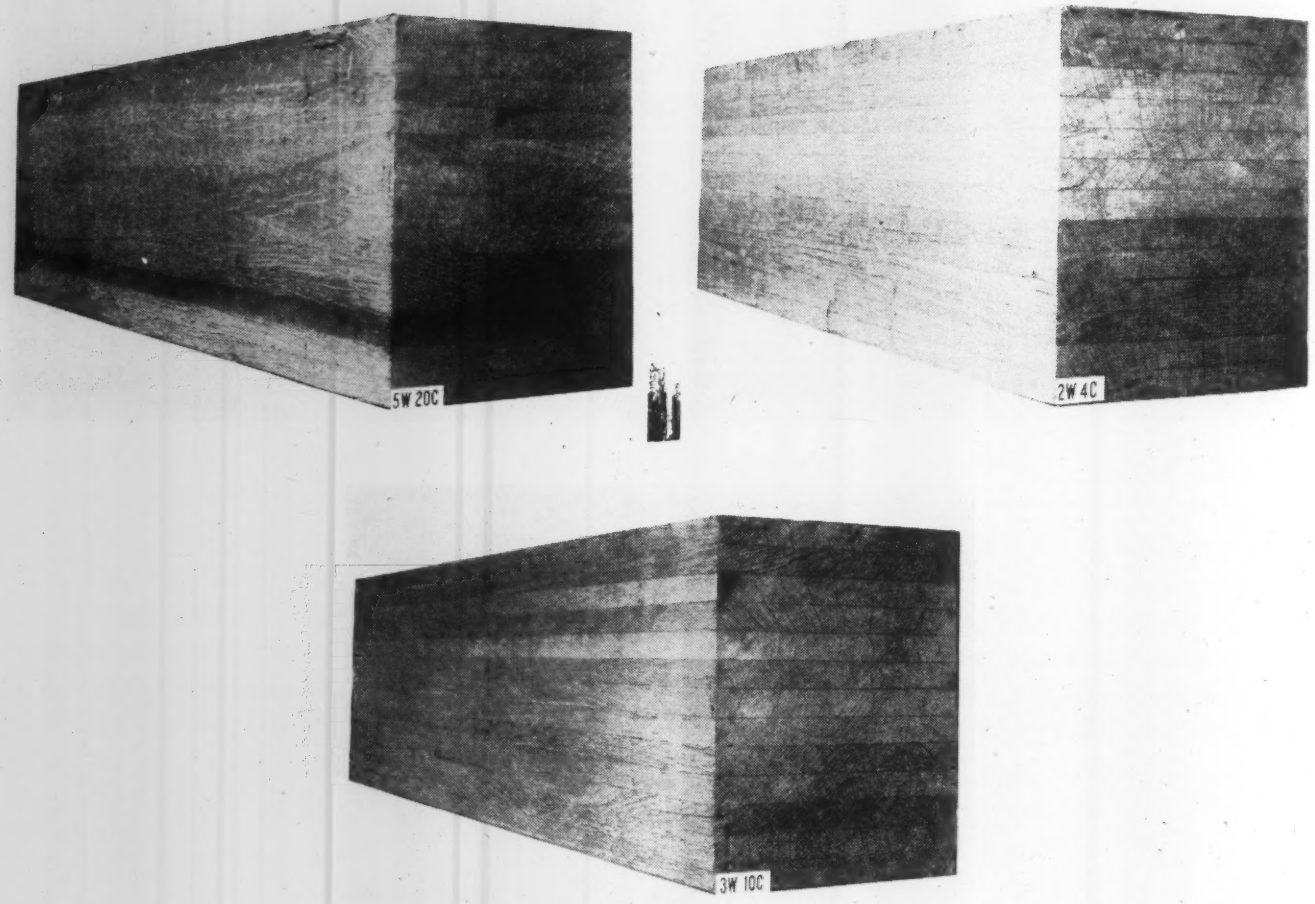


FIG. 11 APPEARANCE OF LAMINATED WHITE OAK BEAMS CURED AT 210 F, AFTER EXPOSURE TO WEATHER WITHOUT PROTECTION FOR $7\frac{1}{2}$ MONTHS

(Beam 5W 20C is glued with a melamine resin, and beams 2W 4C and 3W 10C with low-temperature phenolic resins.)

strongly acid catalysts, which deteriorated the wood adjacent to the glue joint during the heated curing period and weakened the joint. Current Army and Navy glue specifications limit the acidity permitted in such glues to a pH not less than 2.5, and the results of the tests indicated that this limitation on glues for laminating timbers is desirable.

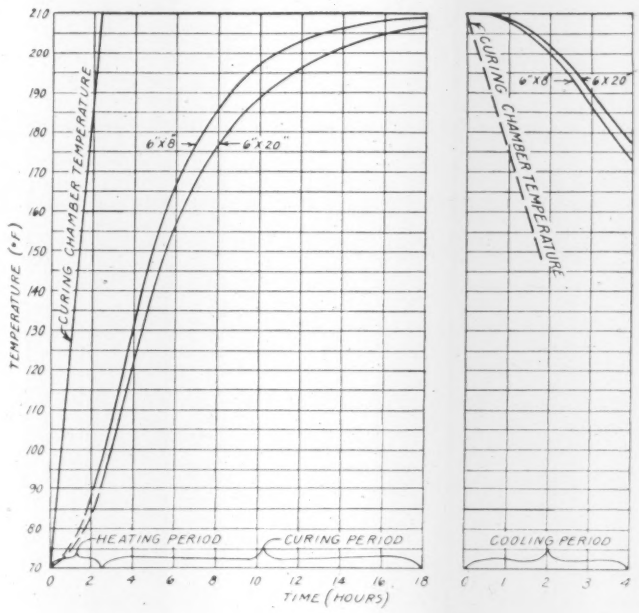
There are not many methods available by which sizeable glued, laminated assemblies may be heated to the temperature required adequately to cure the glue joints. The most feasible and practical method has been to place the clamped assembly in a room which could be heated and thus introduce heat from the outside into all glue-line areas in the laminated assembly. The rate of heating of a timber in this way is necessarily slow. Various electrical methods, such as high-frequency or resistance heating, offer more rapid heating but so far the details of using them in curing large laminated assemblies have not been perfected.

Curing the assemblies in heated chambers has been found satisfactory in laminating white oak, Douglas fir, and shortleaf pine in widths up to 8, 10, and 12 in. The curing-chamber temperature is maintained at about 20 deg F higher than that required in the inner glue line, so that white oak has been cured in a room maintained at 210 F, shortleaf pine at 180 F, and Douglas fir at 160 F, for a period of time sufficient to heat the innermost glue line to the required curing temperature for not less than 10 hr. The rate of heating the interior of laminated clamped assemblies is illustrated by the temperature-time curves in Fig. 12, which is one of a series of similar curves published by the Forest Products Laboratory.[4] These charts can be used in determining total length of time required for heating.

It has also been found necessary to control the humidity in the curing chambers. Heated chambers without provision for humidification are normally very dry, and drying of the laminations would develop shrinkage in their thickness at the edges and consequently result in open glue joints. The interior of the lamination would dry out and shrink exceedingly slowly, and increased clamping pressure would not be able to compensate for edge-drying and shrinkage. It was found practical to avoid drying out of the lamination edges by controlling the humidity to maintain the moisture content in the wood at about 10 per cent. A chamber of conventional modern dry-kiln construction, built to permit sufficient control of relative humidity to maintain an equilibrium moisture content of 10 per cent in the glued assembly, is satisfactory. Fans are used in the chamber to provide circulation, and thermostats automatically control the temperature and humidity.

As a further precaution, the rate of heating the assembly was controlled to avoid the development of condensation on the surface. During the cooling period following the curing, it has been found beneficial to maintain a high humidity by the use of a fine water spray, which absorbs heat and at the same time avoids drying of the cooling assembly. Assemblies are cooled in the chamber before removal to avoid checking and case-hardening in the laminated products.

[4] "The Laminating of Timber Products With Low-Temperature, Phenolic-Type Resin Glues," Forest Products Laboratory, Mimeograph No. R1437.



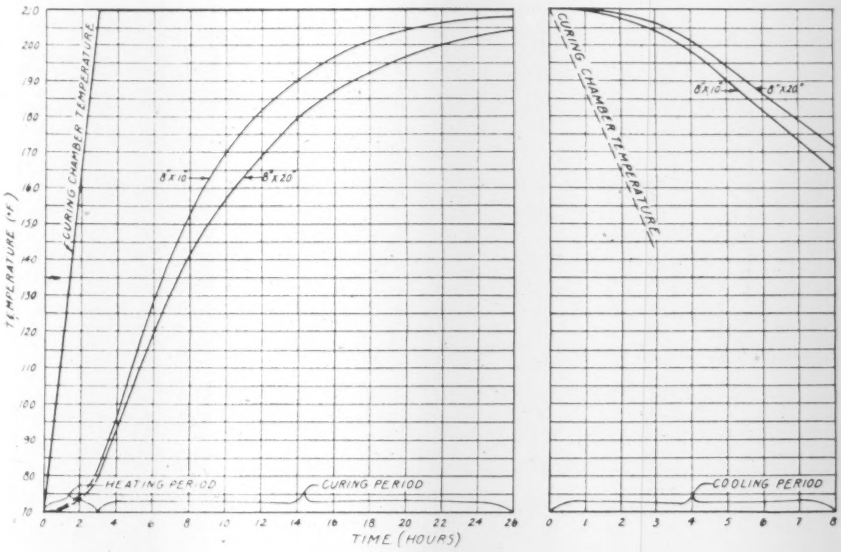


FIG. 12 GLUE-LINE TEMPERATURE AT CENTER OF LAMINATED WHITE-OAK BEAM HAVING LAMINATIONS 6 AND 8 IN. WIDE: CURING CHAMBER HELD AT 210 F AND 80 PER CENT RELATIVE HUMIDITY

It has been found that the frame clamps are generally loose when the cooled assembly is removed at the end of the curing process, and that the caul boards are severely compressed directly under the clamp heads. This requires that the caul on top of the stack be able to withstand such gouging.

No ill effects due to loosening of the frame clamps in the kiln have been found. The loosening appears to take place during the cooling period, after the glue has been cured and no further pressure is needed.

SUMMARY

A new type of laminated timber product capable of giving satisfactory glue-joint performance under extreme conditions of exposure has been developed as a result of the critical wartime need for timbers for boat and shipbuilding. Such laminated timbers can be expected to be as resistant to decay, insects, and fire as solid timbers of the same kind of wood.

A technique for laminating timbers with low-temperature-setting phenol-, melamine-, and resorcinol-resin glues has been developed and has been used successfully in the fabrication of more than 1,000,000 fbm of white-oak ship timbers. These glues have demonstrated in laboratory tests that, when properly cured, they are highly resistant to both fresh and salt water and there has been no report of glue-line failure in service in any of the laminated products produced in accordance with this technique. Recommended curing schedules have also been developed for laminating Douglas-fir and shortleaf-pine timbers with the same types of glue for equally severe exposure.

Although most of the production to date by these methods has been concerned with such items as boat keels, frames, stems, skegs, and planking, the postwar prospects of producing laminated timbers with durable glue joints, according to this process, for exterior and marine use appear promising.

Some typical laminated products that have been made for use under severe exposure conditions include a 1-piece white-oak stem and keel for a 50-foot motor launch shown in Fig. 13 and a set of 14-foot Southern yellow-pine railroad bridge stringers shown in Fig. 14.

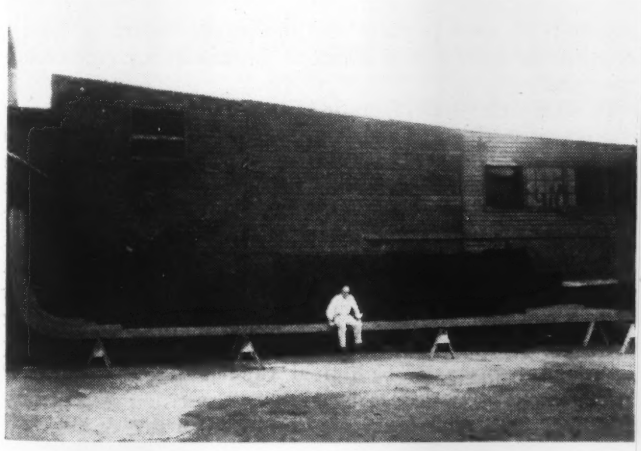


FIG. 13 ONE-PIECE BOAT STEM AND KEEL OF LAMINATED WHITE OAK

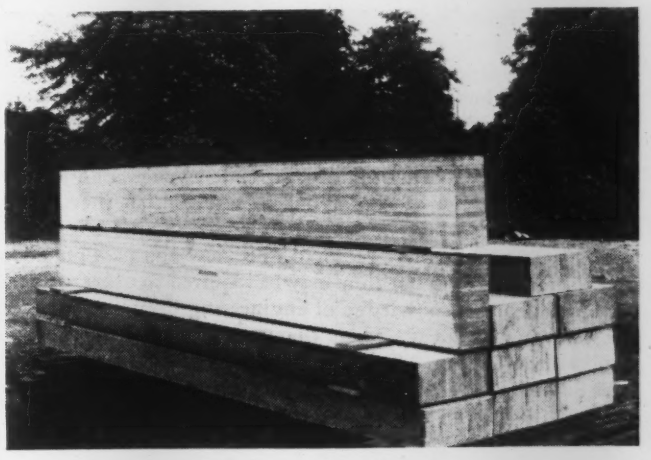
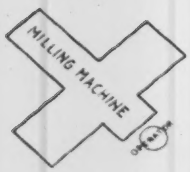
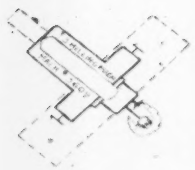


FIG. 14 LAMINATED SOUTHERN YELLOW-PINE BRIDGE TIMBERS (Timbers were pressure-treated with creosote before placed in service.)

MODEL



BLOCK TEMPLATE



2-DIMENSIONAL TEMPLATE

FIG. 1 WHICH METHOD GIVES THE BEST VISUALIZATION, THE BLOCK TEMPLATE, THE TWO-DIMENSIONAL TEMPLATE, OR THE MODEL?

THREE-DIMENSIONAL PLANNING[1]

New Trends in Industrial-Plant Layout

By R W. MALLICK

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, EAST PITTSBURGH, PA. MEMBER A.S.M.E.

INDUSTRIAL-plant planning and layout is, in essence, a coordinating activity rather than a fundamental science and therefore involves practically every function and activity of the plant. Everything that is done in planning the layout affects some person or activity in the organization so that the success of the plan depends largely on its "salability" before it is made a reality.

Many hundreds of hours can be spent by planning engineers in devising a layout and every feature may be mentally visualized by them, but these impressions are often difficult to convey to managers and supervisors by the present practice of template layouts and engineering drawings.

Most executives cannot afford the time to engage in lengthy detail explanations of the layout features which they cannot immediately see when viewing the plan.

Many persons who are required to review and pass judgment on the merits of a layout they may be required to operate do not have a thorough knowledge of engineering drawings and cannot easily visualize the plant that is represented by the two-dimensional layout. Others who suggest changes to areas with which they may be familiar do not comprehend the structural and mechanical difficulties that may occur as a result of such suggestions.

One of the most serious hindrances to preparing two-dimensional layout plans is the lack of uniformity of standard methods of representation. There is either a lack of standards or a multiplicity of symbols, colors, template shapes and sizes, scales, drafting practices, and methods of presentation. While every layout is its own problem and the proper approach must be determined, there is still a lack of uniformity among common practices.

In most industrial plants it is common practice to measure equipment in the field and prepare paper templates from these field measurements. Because of the irregular shapes of most machinery, these templates become the result of judgment as to size and shape rather than accepted standard practice. When it is difficult to show shape and clearances there is a tendency to make a "block template" which adds further discrepancy to the layout. Since field checking and template making appear to be a "mediocre task," it is usually performed by the junior members of the staff. Should their knowledge of the equipment and its operation be limited, the template is apt to be inaccurate and serious consequences may result.

When three dimensions are employed, many of these difficulties disappear. The viewers do not have to rely on mental visualization to comprehend the layout. The planners do not have continually to visualize each detail and carry this mental

[1] This article is condensed from paper presented at the 1944 Annual Meeting of the A.S.M.E.—EDITOR.

Contributed by the Materials Handling Division and presented at the Annual Meeting, New York, N. Y., Nov. 27–Dec. 1, 1944, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

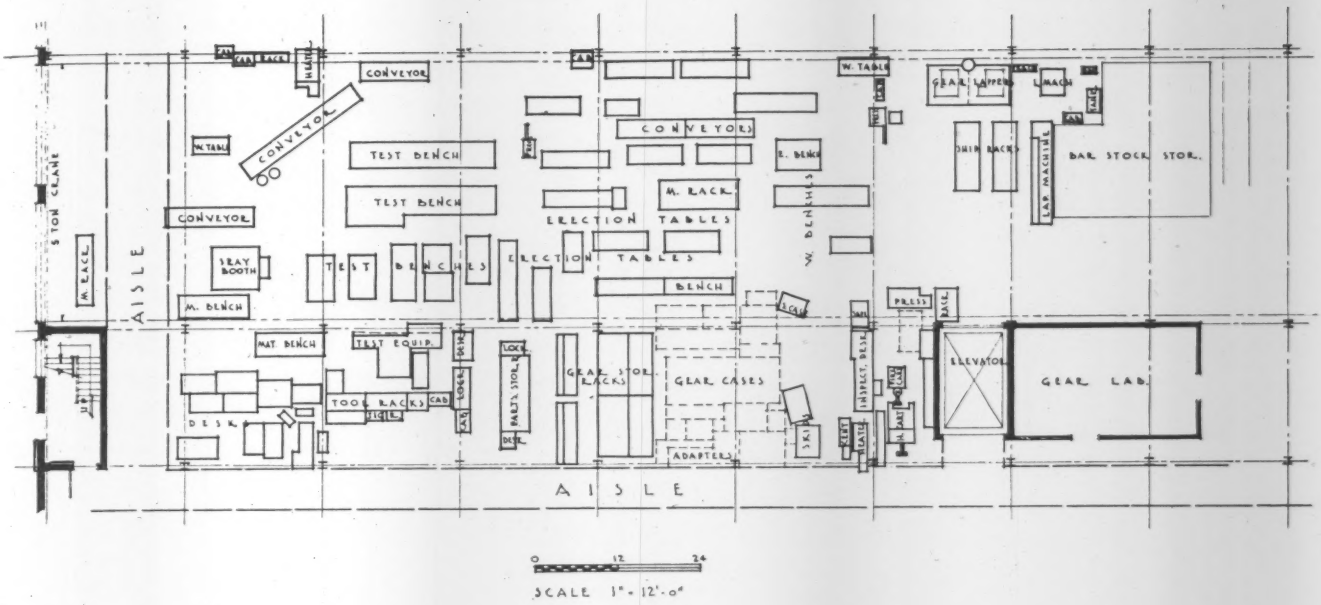


FIG. 2 TYPICAL PLANT LAYOUT DRAWING IN TWO DIMENSIONS

picture throughout the planning. Irregularities and discrepancies are quickly apparent. The layout can be prepared, fully utilizing the cubical space rather than the floor areas only as is often done at present. Greater accuracies in work-area layouts result. Finally, and to the surprise of many, the layout can be prepared in much less time and at a much lower cost than by the conventional one-plane method.

ADVANTAGES OF SEEING IN PERSPECTIVE

Let us explore briefly some of the theories which support this new science.

In mechanical drawing, the draftsman's efforts do not result in a drawing of an object as it would appear to the eye when viewing the object itself. Consequently, engineering drawings can only be read and understood by persons trained in interpreting such drawings. So complex is this language that engineers trained in one field cannot always read and interpret drawings and data pertaining to some other engineering field. This is not at all uncommon.

Architects and artists recognized this condition long ago and, wisely employing good sales psychology, presented their cases in a manner easily understood and accepted by anyone. A knowledge of engineering terms was not necessary. In plant-layout engineering the resultant plan must also be presented to nontechnical personnel; therefore the pictorial, or three-dimensional method is most effective.

The earliest known principle of three-dimensional viewing, the science of perspective has been used by artists and scientists for centuries. The illusory advantages of making individual masses appear solid in pictorial space have been recognized by even primitive artist. In the 14th and 15th centuries, the artists Alberti and Dürer established the first scientifically sound principles of perspective.

The application of perspective in pictorial presentation gives a sense of form and depth.

Three-dimensional presentation is further enhanced by application of shades and shadow.

The polaroid principle of three-dimensional perception has opened new fields in visual presentations. This method has proved so effective that it is being used by branches of our military service for instructional purposes where studies in the third dimension are necessary. Three-dimensional photography embodying the polaroid principle has space in the visual field; therefore, it gives a sense of reality. Thus photographs shown in color and motion by the polaroid principle give an almost perfect illustration and afford the observer a sense of reality rather than one of viewing pictures.

The recognition of this problem in plant-layout engineering is of utmost importance, for the product of the engineer's effort does not remain among engineers and hence cannot be recorded in their language. While the purely engineering aspect of the work must be carried on according to engineering standards and accepted practices, the presentations of the design must, for most effective results, be presented in a neutral and natural manner.

SOME EXAMPLES OF THREE-DIMENSIONAL LAYOUT

To illustrate how much bearing the method of presentation has to the ability to visualize on the part of the viewer, several examples are presented.

Fig. 1 shows a block template, an accurate two dimensional template outline, and a scale model of the same machine. Each of these means is used in preparing and presenting plant layouts. It can readily be seen that the two-dimensional template is far superior to the block template. By the same token, the three-dimensional scale-size model far exceeds the two-dimensional template for both purposes of engineering study and presentation to viewers.

Fig. 2 is the layout drawing of a department in one of the plants of the author's company. For clarity all unnecessary lines have been eliminated. Study it for a moment and create in your mind a mental picture of what you think this department would look like as represented by this drawing.

Fig. 3 is a photograph which shows a panoramic view of the department represented by the layout of Fig. 2.

Actually our eyes are tiny cameras that convey to the brain images of what they see. From this image the brain must do its work of perception and determination. By making perception easier, the functions of determination and decision take place more quickly.

Fig. 4 shows how a layout can be presented pictorially for purposes of explanation. It has little value for engineering purposes but can serve to demonstrate to a layman how a proposed plant will function.

Fig. 5 shows a typical plant layout used during certain stages of development. It represents about what can be visualized by looking at a reasonably good two-dimensional layout.

In Fig. 6, however, to the same layout models of some of the

FIG. 3 A PHOTOGRAPH OF THE ACTUAL PLANT LAID OUT IN FIG. 2

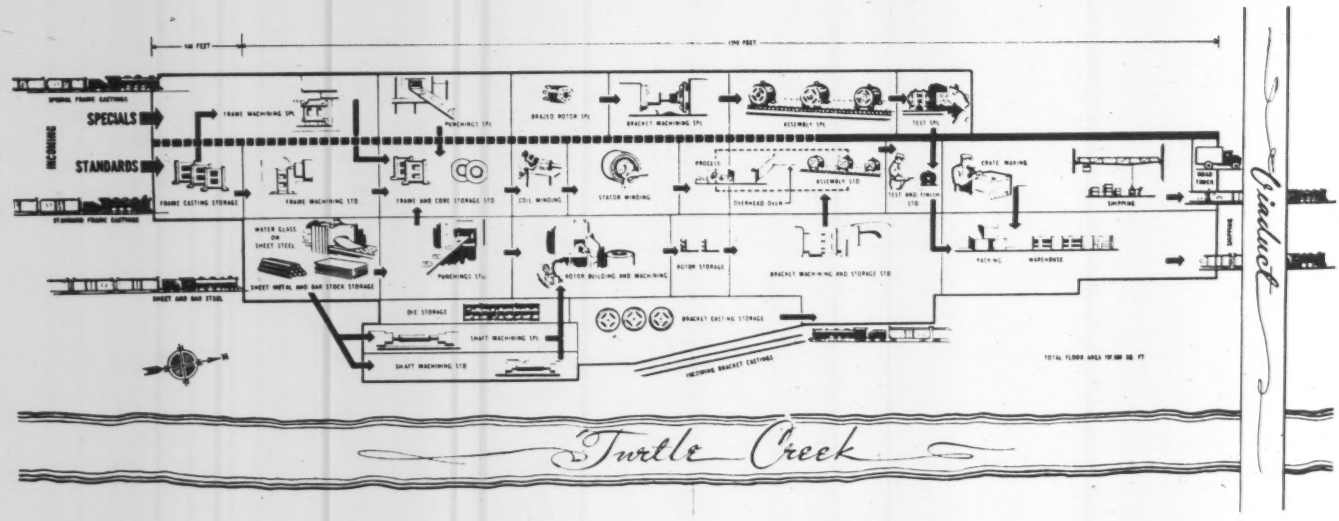


FIG. 4 A PICTORIAL LAYOUT IS OF LITTLE VALUE TO AN ENGINEER BUT INDICATES HOW A PLANT FUNCTIONS

equipment to be installed have been placed on the outlines of the drawing.

Another problem in three-dimensional layout is illustrated in Figs. 7 and 8.

Fig. 7 is a plot plan of a plant. The buildings are all multi-story except two, and the building floors are at various levels.

Fig. 8 is a model of the same plant showing the buildings stripped of their walls and roofs and the floors in exact relationship to each other and to the surrounding terrain.

Another example of three-dimensional layout is illustrated in Fig. 9 which is a model of a tungsten-ore-reducing plant. The equipment on each floor has a direct relationship to the equipment on the other floors. In studying the layout, the vertical as well as horizontal relation must be kept in mind at all times. Perception of this layout in two dimensions is a task beyond the scope of most persons.

RELATIVE COSTS OF LAYOUT METHODS

Our experience with the use of three-dimensional presentations has enabled us to determine factually the relative cost of various methods of presentation. Most persons believe that perspective sketches or three-dimensional models are expensive

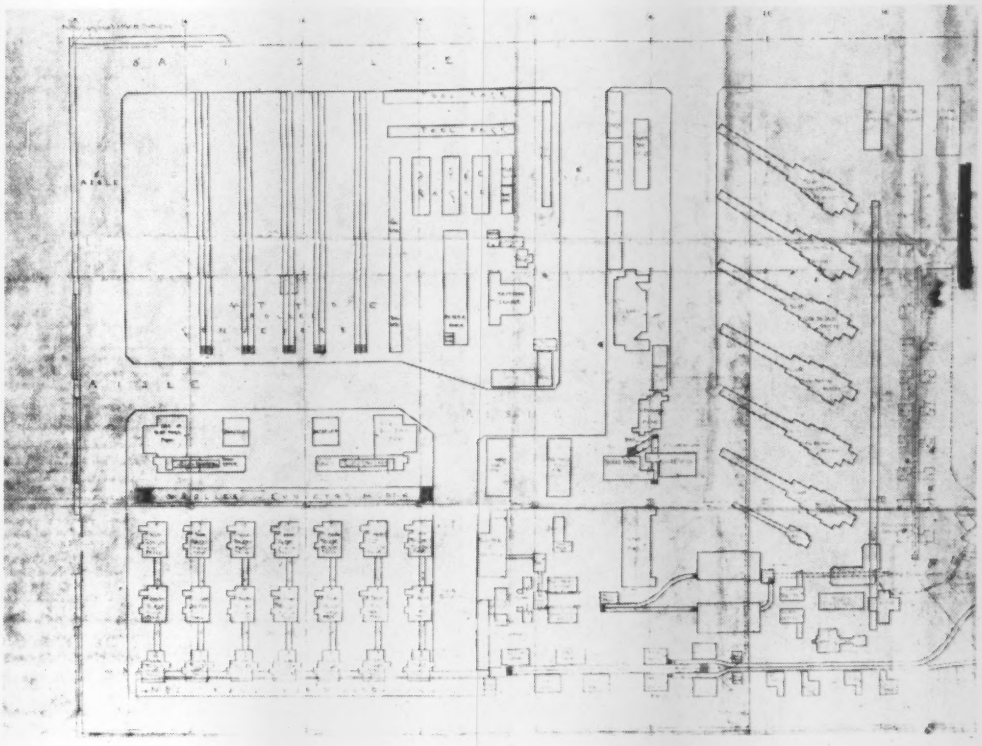


FIG. 5 TYPICAL TWO-DIMENSIONAL LAYOUT TO SHOW LOCATIONS OF MACHINES

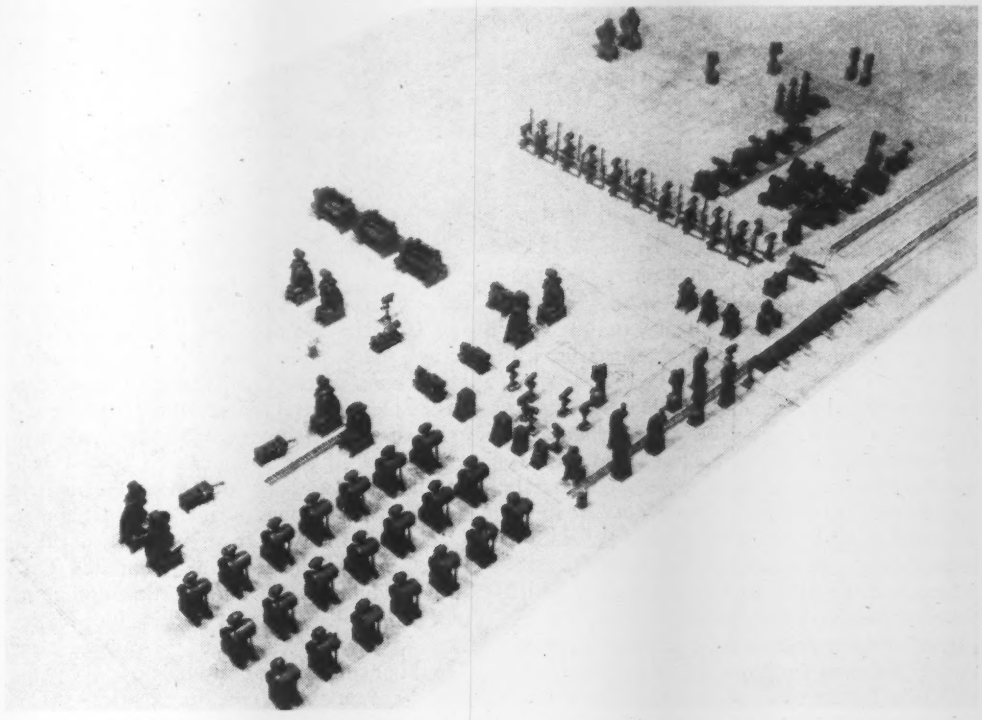


FIG. 6 WHEN MODELS OF MACHINES ARE PLACED ON THE LAYOUT DRAWING OF FIG. 5, THE PROPOSED PLAN IS READILY VISUALIZED

because they look expensive. However, just the reverse is true.

Cost must be based on at least two factors. First, the initial cost, or the cost to produce the effect desired. Second, the ultimate cost, or the initial cost measured against the results and the intermediate benefits.

In the case of models, we have found that hand-made models, especially prepared for a specific project requiring only a few items, and probably no duplicates, are somewhat costly. However, the results obtained usually justify the cost

On the other hand, large projects requiring large numbers of models, many of which are duplicates, are cheaper to make than paper template and drawing layouts.

Models can be used many times whereas paper templates, as a rule, must be made every time a new layout is planned. In some instances the templates are worn out before the layout is finally completed.

As to results, no one will question the superiority of models over templates. The tremendous benefits gained, in time re-

FIG. 7 THE TWO-DIMENSIONAL DRAWING GIVES NO INDICATION OF GRADES AND FLOOR LEVELS

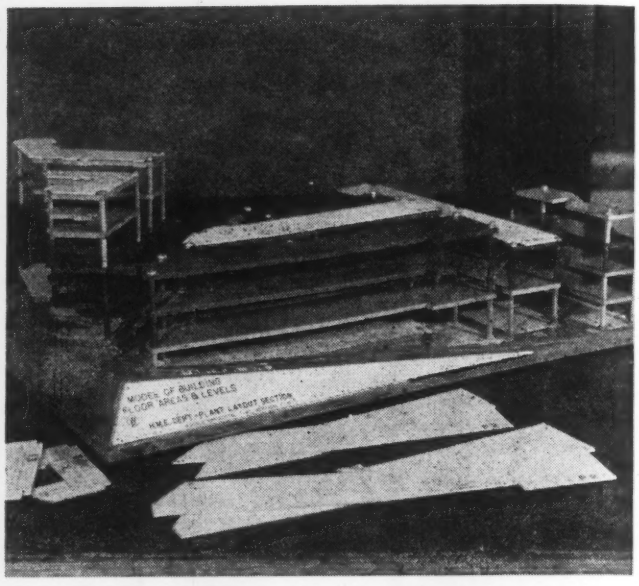


FIG. 8 THE MODEL OF FIG. 7 SHOWS HOW GRADE AFFECTS AVAILABLE FLOOR SPACE

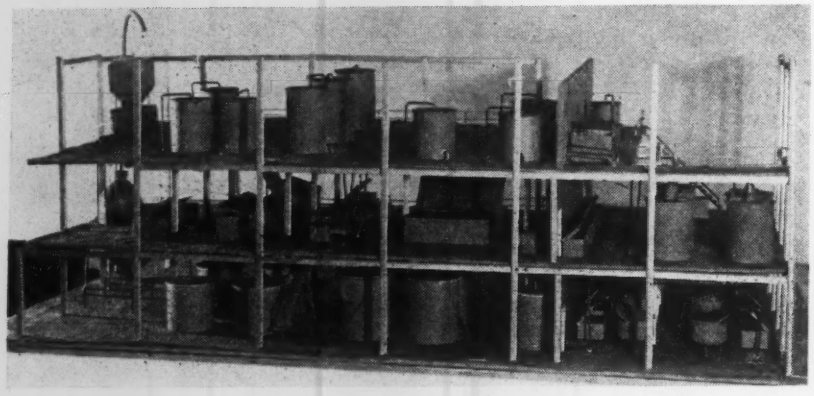


FIG. 9 A MODEL OF AN ORE-REDUCING PLANT SHOWS NOT ONLY THE HORIZONTAL BUT VERTICAL RELATIONS OF PIECES OF EQUIPMENT

quired to prepare the layouts when working with banks of models, the better arrangements that can be made, and the time saved in conferences and approvals, can hardly be measured in monetary terms.

Let us now turn for a moment to the advantages which three-dimensional study affords to the engineer from another viewpoint. We have become entirely too accustomed to refer to an industrial plant in terms of floor area. We momentarily forget that factory structures are "cubes" rather than "squares," and millions of cubic feet of space are being wasted because we still design our plants in two planes rather than three.

Technological advance during the past two decades, which has provided mechanical handling and storing devices, and the thousands of "gadgets" on the market for operation improvement, has thrown the practices employed in the plant layout out of phase with these mechanical advances. This has resulted in plant efficiencies, per square foot of space, far below the ultimate potential.

It is not uncommon to pick up trade magazines, textbooks, or even actual plans and see a predominance of block templates and crude line drawings showing a plant-layout scheme. Sometimes these are used to show the advantages of the scheme being described. This practice imposes a handicap on "salability."

Every plant-layout proposal or materials-handling scheme, as a rule, is discussed among plant supervisors and presented to company executives for discussion and approval. Many executives are too busy with their regular duties to visit their plant frequently. If changes are made in the plant between these visits the executive's mental picture of plant conditions and facilities are obsolete. If the geographic location of the actual plant under discussion is at some distance from the executive's office, the persons discussing it probably do not have a clear mental picture of the "before and after" conditions.

By the use of three-dimensional drawings and models an exact replica of the plant can be placed before the executives and much guesswork and mental visualization can be eliminated. Many hours of time of valuable men can thus be saved.

It is not likely that anyone will argue against the benefits which arise from the use of visual aids which help bring about sound judgment and result in thorough approval or disapproval of a proposal. It is just putting into reality the literal expression we have often heard, "I can see clearly that this thing should or should not be done."

How often do we have the experience of someone in authority saying, "I am not sold on the scheme," or, "I do not like this arrangement," when we believe he is speaking from a subconscious feeling rather than a real understanding of why he does not like it. When a group of men sitting around a conference table all view the same problem in the same light, then, we shall certainly get better decisions more promptly. Worthwhile projects will have a much better chance of survival with much less likelihood of being the victims of the likes, dislikes, or intuitions of people who may not understand clearly the principles or the objectives. We sincerely believe that the next decade will see the universal use of three-dimensional planning in the science of industrial-plant layout.

Dressing GRINDING WHEELS

New Developments Made Possible by Plunge Form and Thread Grinding and the Crush-Dressing Process

By W. FAY ALLER

DIRECTOR OF RESEARCH, THE SHEFFIELD CORPORATION, DAYTON, OHIO

THE abrasive grinding wheel has always played an important part in the modern production of metal components, and its usefulness is in direct proportion to the growing tendency to reduce tolerances. This has naturally resulted in a more intensive study of the preparation of abrasive wheels and surfaces, with many interesting developments.

METHODS OF DRESSING ABRASIVE WHEELS

The accepted method of dressing or preparing the abrasive-wheel surface for work has been accomplished by the use of sharp diamonds, or other hard material such as the carbides, usually termed "diamond dressing." This method is such common practice as not to require description, except to recall that, if various forms are to be reproduced, it is necessary to control the path of the diamond to give the desired form to the wheel.

Probably equally old is the process of dressing a wheel by means of a number of freely rotating washers mounted on a suitable handle. This tool is normally used for roughing up pedestal abrasive wheels, and grit can be removed from the face of the wheel very rapidly. From this it is a short step to modern "crush-dressing." For many years this principle for the accurate dressing of grinding wheels has been undergoing improvements in Europe, and for several years it has been receiving specialized development in the United States.

Crushing of abrasive wheels may seem revolutionary to some at first glance, as the method has not had widespread industrial application in America. Since its general commercial introduction in this country, rapid progress has been made as industry has come to realize the advantages. Abroad, the development has been primarily used in the grinding of threads, due largely to the European and English practice of grinding threads with multiribbed wheels. The benefits of this method are so outstanding, it is not surprising that great strides have been made in multiforming the ribs of grinding wheels. Various and often complicated fixtures were used for diamond dressing of these wheels, and, while searching for a simpler operation, the crushing technique was developed. While it was primarily intended to simplify the fixtures for forming the wheel, advantages were discovered that are far more important than the simplification.

For a number of years several enterprising toolrooms in the United States used the crushing technique with excellent results. For example, one company found it profitable to make lamination-die sections on the surface grinder after first crushing a wheel to the desired shape by means of a soft-steel crusher mounted on a fixture. This fixture allowed free rotation without end movement. The wheel was run down against the crusher, and a crank was used to turn the wheel slowly and impress the form in its surface. There are probably other cases, which have never come to light, where the ingenuity of a toolmaker put this principle to use.

Contributed by Special Research Committee on Metal Cutting Data and Bibliography and Special Research Committee on Cutting Fluids and presented at the Annual Meeting, New York, N. Y., Nov. 27–Dec. 1, 1944, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

TECHNIQUE OF CRUSH-DRESSING

Roughly speaking, the present technique of crush-dressing an abrasive wheel is as follows: A crusher is made similar to a circular form tool, carrying the identical shape to be ground in the workpiece. This crusher is usually mounted on anti-friction bearings that will allow no end play. It is placed in a suitable fixture which, in turn, is attached to the machine by a method depending upon the type of installation, and permits the crusher to be slowly moved toward the wheel or the wheel toward the crusher. The axis of rotation of the crusher should be parallel to the axis of rotation of the grinding wheel for best results.

The peripheral speed should be approximately 250 to 300 fpm. While rotating, the axes of the two are slowly brought together with the result that grit is removed from the wheel.

CRUSH-DRESSING HAS MANY ADVANTAGES

As previously mentioned, in the development of crush-dressing a number of advantages were found to be of greater importance than the simplification. They may be listed as follows:

1 On the most varied of profiles, crush-dressing forms the wheel to the desired shape in a fraction of the time possible by any of the previous conventional dressing methods.

2 Crush-dressing provides a better cutting surface with many more sharp cutting points and without the dull flats produced by diamond-dressing.

3 The number of pieces that may be ground per dressing is remarkably increased.

4 The cost of dressing tools is greatly reduced, not only because of the number of pieces ground per dressing, but also because of the tremendous number of dressings possible with the crusher-dressed tools. Although still having some limitations, this is the modern inexpensive way of dressing a grinding wheel and getting the most intricate of shapes.

5 Longer wheel life is obtained by crusher-forming because it is only necessary to remove the dulled grits. The dressing operation itself does not tend to dull the grits as in diamond-dressing.

6 Crusher-dressing allows closer grinding of work, reduces hazard of burning, and less pressure is necessary to remove stock.

ABRASIVE-WHEEL STRUCTURE

Before examining these six advantages in greater detail, it is important to consider the abrasive-wheel structure, which consists primarily of grains, bond, and voids. The grains do the actual cutting and are held in place by the bond. The voids are the spaces between the grains which provide clearance for chips that are cut by the abrasive grains.

There are various types of grains and bonds, and the function of the former is to act as a cutting tool. Its many facets serve to cut away the metal, just as the sharp surface on a cutting tool in a lathe or shaper removes chips. Because the facets cannot be disposed in any particular orientation, the number of these sharp cutting points depends upon chance to

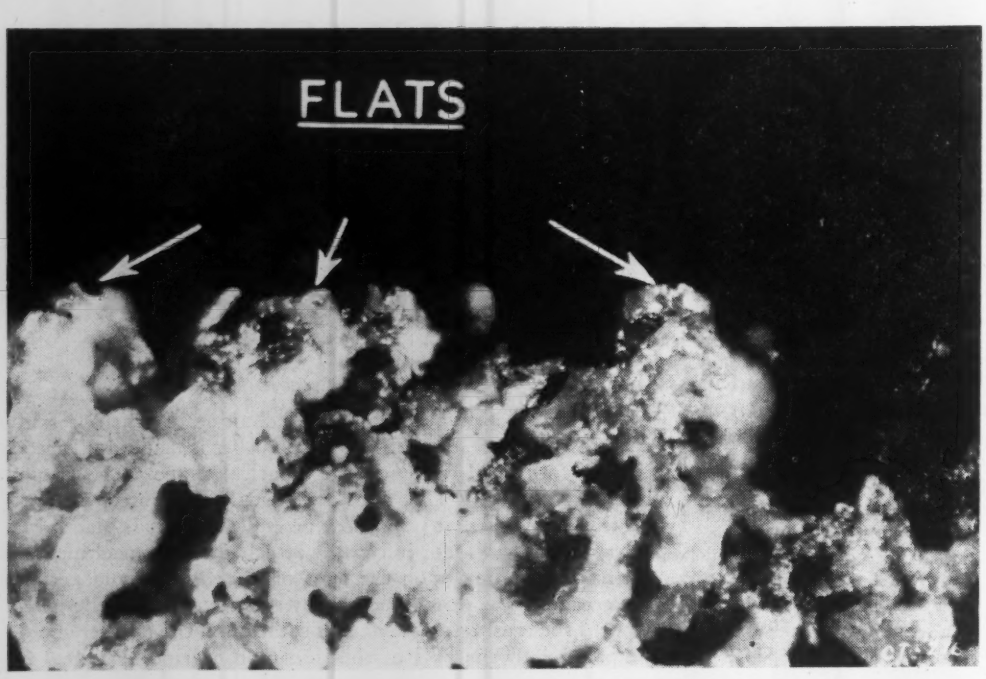


FIG. 1 IN DIAMOND-DRESSING, GRAINS ARE OFTEN CUT, RESULTING IN NUMEROUS FLAT SURFACES

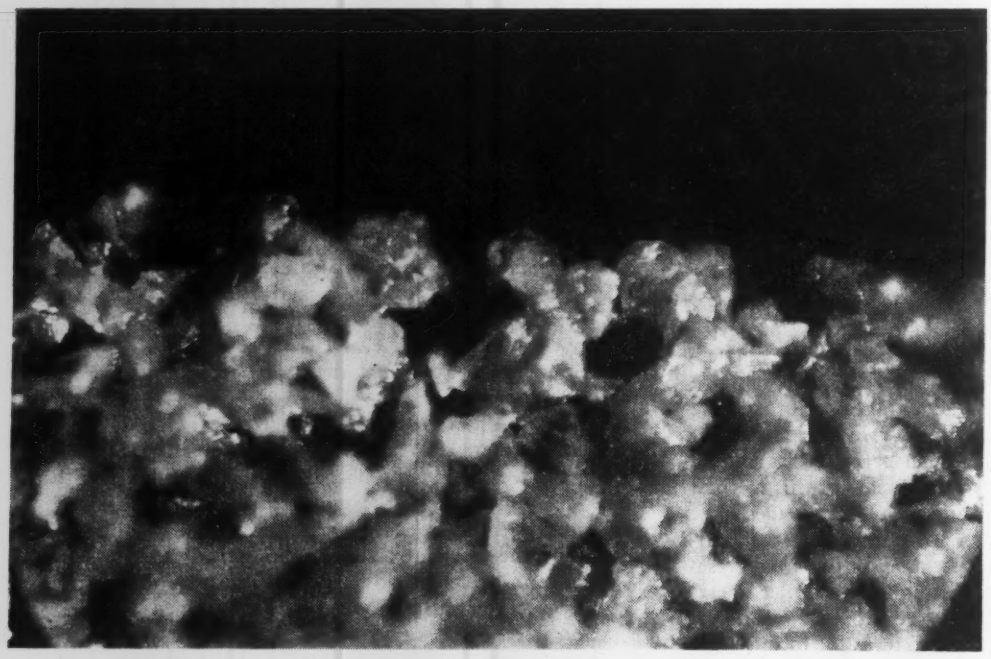


FIG. 2 IN CRUSH-DRESSING, GRAINS ARE BROKEN AWAY INSTEAD OF BEING CUT, LEAVING SHARP EDGES

provide that they will produce one or more cutting surfaces. The bond must be of such a nature that it will cement the grains together firmly, and yet not fill the voids which act as clearance for the chips.

To obtain a free cutting and efficient surface on an abrasive wheel, it is important that the sharp cutting faces of the grains be not removed. In diamond-dressing, the sharp diamond in many cases cuts the grains instead of tearing the grain from the bond, creating a flat dull surface. If a number of these surfaces occur in a wheel, a burnishing rather than a cutting action is produced when pressure is applied. Because of the flattening of the grains, it is often possible to achieve a better surface finish when a wheel of the same grain is diamond-dressed than can be done with a crushed wheel in which no grains are flattened. In grinding hardened materials, such a procedure may cause sufficient heat to soften the material being ground.

Photomicrographs are offered to demonstrate further the fact that grains are actually cut by diamond-dressing; while contrariwise, in crushing, the grains are merely broken away leaving sharp cutting surfaces.

In Fig. 1, a carborundum grain A-100, grade M, bond 30 wheel has been diamond-dressed. The view was taken parallel to the surface, with a magnification of 75 diam. Close observation shows flats on a number of the grains. Another view of the same wheel was taken at the same angle as in Fig. 1, after being crusher-dressed. There is an absence of flattened grains, and all the grains appear to be sharp as desired.

Other photomicrographs confirm these results as being generally true of diamond- and crush-dressed wheels.

CRUSH-DRESSING REQUIRES LESS TIME

The six major advantages found in crush-dressing of abrasive wheels have been briefly mentioned. In (1), the saving of time in forming the wheel was stressed. The operation of crush-dressing the wheel is extremely fast as, after initial crushing, it is only necessary to run the crusher roll down in contact with the wheel, revolve the wheel at crushing speed, and feed the crusher roll in approximately 0.005 in. The crusher roll is retracted, and the grinding cycle begun. This is a rapid operation compared to diamond-dressing, even on symmetrical forms, such as threads, where a multiribbed wheel is used. However, if the form is not symmetrical, the saving in time is even greater. Because of the sharpening of the wheel as well as the use of multiribs in thread-grinding, the number of pieces that may be ground between dressings is very high.

BETTER CUTTING SURFACE

Advantage (2) cited is the better cutting surface presented by the crush-dressed wheel. This point has been demonstrated in Figs. 1 and 2, and tests quickly show that a wheel dressed in this manner operates with less heat and pressure, as may be seen in Fig. 3. The part shown consists of two pieces of tubular S.A.E. 1015 steel. The inside is bonded to the outer with rubber. In grinding them to required limits in the conventional manner, using an abundance of coolant, the heat generated was sufficient to cause the rubber to pull away from the outer case. To remedy this condition, it was necessary to make a series of

very fine cuts, with the result that production of the thread-grinding alone dropped to 4 parts per hr. It was decided to try plunge-grinding with a crushed wheel. Production soon indicated the removal of stock was much more rapid, and the rubber-to-metal bond remained intact. By this method the parts were ground at the rate of 40 per hr.

To determine approximately the reduction in pressure necessary to remove stock by the crushed wheel, a series of arbors 1/4 in. diam by 6 in. long were ground between centers. Starting with a straight cylindrical part and using the same amount of feed with both diamond-dressed wheel and crushed-dressed wheel, it was found in every case that the part had sprung away from the wheel twice as far when a diamond-dressed wheel was used as with the crushed-dressed wheel. This was verified by checking the parts at either end and the middle.

FASTER PRODUCTION WITH PLUNGE-GRINDING

Fig. 4 shows a part of chrome-moly steel with a 32 to 36 Rockwell C scale hardness. The threads on the end are 7/8-20 class-3 fit. The best previous production using a single-rib diamond-dressed wheel was 54 parts in 8 hr. By plunge-grinding, using a crusher-dressed 220-NT wheel, production was increased to 320 parts in 8 hr, or 600 per cent. It was necessary to redress the wheel only after running 150 parts. Between 25 and 50 dressings may be expected from a crusher roll before refinishing.

It is possible to regrind crusher rolls a considerable number of times, depending upon the form being produced. This

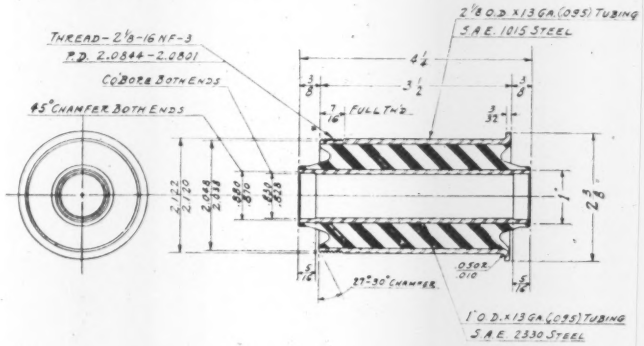


FIG. 3 TWO PIECES OF TUBULAR STEEL BONDED WITH RUBBER
(Conventional grinding often causes separation due to heat generated. Plunge-grinding with a crushed wheel increased production 10 times.)

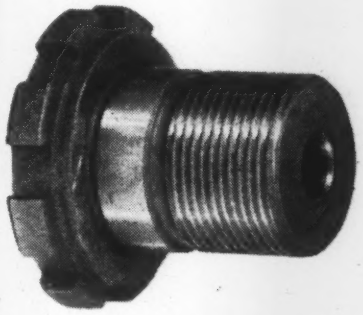


FIG. 4 PLUNGE-GRINDING INCREASED VOLUME OF PART SHOWN 600 PER CENT
(It was necessary to redress the wheel only after running 150 parts.)

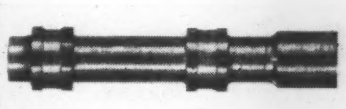


FIG. 5 PRODUCTION OF CHROME-MOLY STEEL PISTON INCREASED 10 TIMES BY USING CRUSHED WHEEL

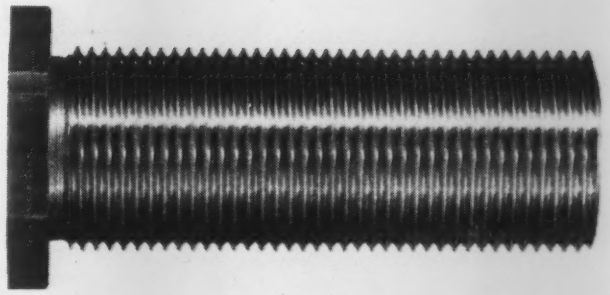


FIG. 6 WITH MULTIRIBBED CRUSHED-WHEEL GRINDING 12 SLEEVE PROJECTORS CAN BE GROUND PER HOUR
(Former rate was 2 per hr.)

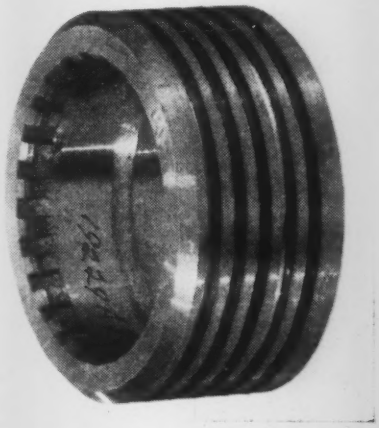


FIG. 7 GREAT TIME-SAVINGS EFFECTED WITH CRUSHED-WHEEL FORM GRINDING TO PRODUCE THIS IMPELLER SPACER

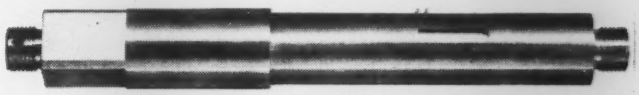


FIG. 8 ABOUT 500 PARTS, SUCH AS ILLUSTRATED, CAN BE GROUND BETWEEN EACH CRUSHING OF WHEEL

graphically illustrates that the cost of dressing tools is reduced, not only because of the great number of pieces ground per dressing, but also because of the many dressings possible before the life of the crusher is ended.

Fig. 5 shows a piston made of chrome-moly steel Rockwell 26 to 36 C scale. In this operation 0.005 in. of stock was to be removed from the outside of four shoulders to a tolerance of plus or minus 0.0005. The tolerance actually held by this process was plus or minus 0.0001. The former production was 8 pieces per hr. By the new method, using the crush-formed wheel, production is 80 pieces per hr.

A sleeve projector is illustrated in Fig. 6, and the material is AN-GG-126; the thread is 1 1/2-NF-3 with a length of 3 7/32 in. By previous methods it was possible to grind 2 parts per hr. Employing multiribbed crushed wheel grinding, 12 parts can be ground per hr.

Fig. 7 shows an impeller spacer, material AMS-6294 steel, with a case hardness of 81 to 84 A scale. It is necessary to remove 0.010 in. of stock on each side and bottom of the grooves. The former grinding time was 18 min per piece. With crushed-wheel form grinding, the same operation is accomplished in 3 min.

The aluminum shaft of a control wheel is shown in Fig. 8. On either end it is required that 7/16 in. of 5/8-18 NF-3 threads be ground. This is accomplished at the rate of 20 sec grinding time per end, using the crushed wheel. On this particular part,

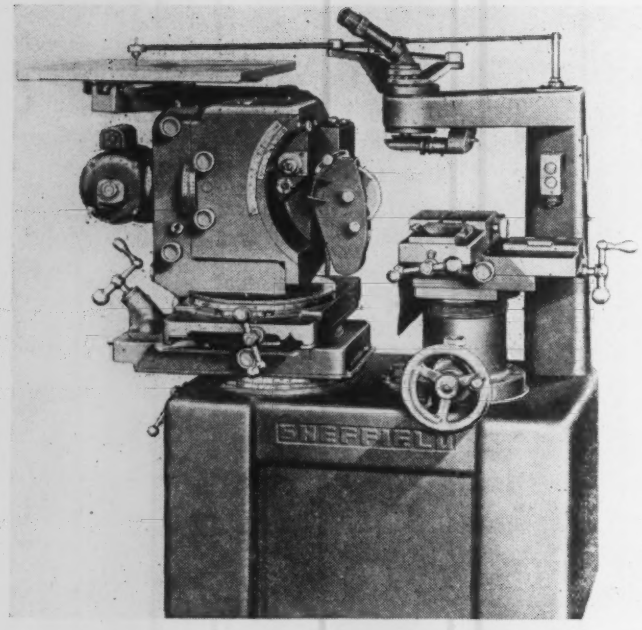


FIG. 9 MICROSCOPE FORM GRINDER FOR PRECISION PRODUCTION OF PROFILES DIRECT FROM DRAWING
(Machine is not limited by regularity or irregularity of work or by straight lines or irregular curves.)

it is interesting to note that 500 pieces can be satisfactorily ground between each crushing of the wheel.

GENERATION OF LESS HEAT

One of the most important advantages in crushed wheel forming is the generation of less heat. Many parts to be ground with some intricate form or threads make use of special steels having carefully controlled heat-treatments to accomplish suitable hardness. In conventional grinding methods, if great care is not exercised, enough heat may be generated not only to draw the steel, but, in many cases, even to burn the metal. Experience in a great variety of work, such as the examples cited, definitely proves that this hazard is greatly reduced, if not entirely removed, with crushed-wheel form grinding. In the grinding of thread rolls for thread-roll snap gages, it was found necessary with conventional grinding methods to grind or mill the rolls to a preformed state before hardening to eliminate softening in the grinding process. Now, by means of the crushed wheel, these rolls are plunge-ground directly from the hardened blank without softening the surface.

In order to use crushed-dressing and forming to its best advantage, three basic machines are necessary. A microscope form grinder, such as shown in Fig. 9, is primarily used in making the master crusher rolls for forms other than threads. On this machine, the crusher blank is mounted on an arbor between centers where it is rotated at grinding speed. A 50 to 1 layout of the shape desired is mounted on the pantograph table. By following along this layout and observing the wheel at the work through the microscope, it is possible to produce almost any form desired to an accuracy of 0.0002 in. regardless of the wheel wear during the grinding operation.

This master crusher is then reproduced into working crushers on a thread-and-form grinder as shown in Fig. 10. In this operation, the master crusher is assembled in the crusher mounting, and a suitable abrasive wheel with a face equal to the face of the crusher is mounted on the spindle. It is possible by this method to make a number of similar master crushers, which, in turn, may be used to produce working crushers, thus greatly reducing the cost of crusher manufacture for very high-production jobs. The thread-and-form grinder can produce crushers direct for all thread forms and is also used in regrinding crushers that have become worn. It is the machine for cylindrical production using the crush-dressed wheel. All of the foregoing examples were produced by this machine.

A surface grinder is used for the production of flat parts involving various forms. In this case, crushers made by the method previously outlined are suitably mounted to the machine to allow for crushing the form into the wheel. Parts are clamped in a fixture, and grinding is accomplished by conventional table traverse. One of the typical examples of parts produced by this method is the impeller bucket for turborotors used on jet-propelled planes.

New grinding methods using this technique are now being tested. These new commercial processes give the engineer more leeway in designing parts that will function best without increasing production cost. For example, unless the alignments of an automotive crankshaft bearing and connecting-rod bearing are very closely held, the load may be carried on either end of the connecting-rod bearing. By using a crush-formed wheel in grinding the crankshaft, a slight crown can be provided which it is logical to believe would assure central loading of the connecting rod, resulting in better and longer performance. Contours of practically any form may be produced in either hard or soft material with extreme accuracy at little or no increase in cost.

INDUSTRY BENEFITS FROM IMPROVED METHODS

To summarize some of the advantages, there is great saving of time in wheel dressing, which means the machine operates for longer periods on production work; a considerable increase in the number of pieces ground per dressing is realized; costs are reduced due to sharper cutting wheels and faster grinding speeds. Higher-quality work and less spoilage are achieved because less heat is generated. Fewer dressings are required, and wheel life is substantially increased.

The term "new" is used throughout this paper, not in the sense of discovery or invention, but rather to denote a conversion from established methods in general commercial use.

The speed with which stock may be removed, compared with the accuracy to which parts can be ground indicates a great future for plunge-forming and thread-grinding, and the crush-dressing of grinding wheels. Many of the accepted methods of processing may be changed by this revolutionary improvement.

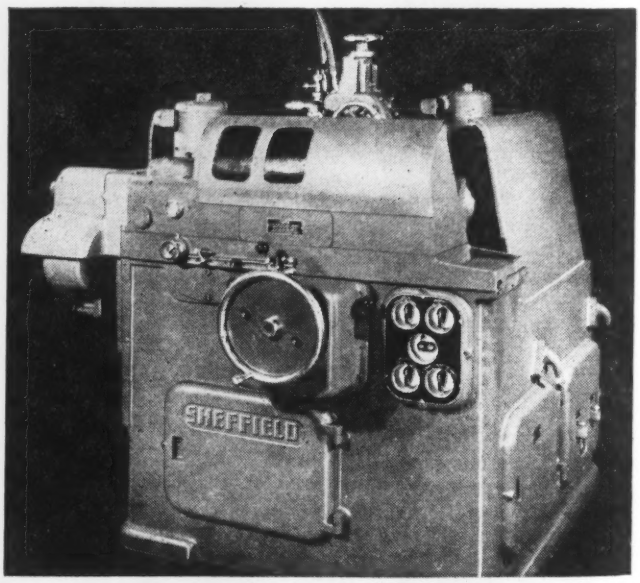


FIG. 10 PRECISION THREAD-AND-FORM GRINDER USED TO REPRODUCE WORKING CRUSHERS FROM MASTER CRUSHER AND FOR REGRINDING CRUSHERS THAT HAVE BECOME WORN
(Remarkable results are obtained in speeding up the grinding of countless kinds of production parts in any quantity.)

PROGRESS *in* RAILWAY MECHANICAL ENGINEERING[1]

1943-1944

DOWN through more than a century of development and progress in those phases of mechanical engineering which have contributed so much to the building of the rail transportation machine which has played so prominent a part in the war, we have been accustomed to look upon engineering developments in the field of motive power and rolling stock as related merely to design, construction, and maintenance of equipment. We approached the war year 1940 with an acceptance, based upon experience in the past, of the fact that the ability on the part of a railroad to move freight and passengers depended primarily upon the possession of an adequate number of units of equipment of sufficient capacity, in good serviceable condition. Having this equipment, a road could handle traffic up to a limit of capacity predicated upon certain factors that had become "standards of practice" in the minds of many railroad operating and mechanical men.

American railroads entered the war years directly upon the heels of 10 years of depression and, on the basis of these older standards, they were in anything but good shape to tackle a job of the tremendous proportions of the one which lay ahead. When both freight and passenger traffic increased, month by month, to peaks which had not been attained in the railroad industry since the late 1920's, there were serious doubts, on the part of many who were close to the situation, of the ability of the roads to keep up with the demands upon them. A poor priority position with respect to materials and, as the war progressed, an increasing shortage of manpower only made a difficult position more difficult.

Fortunately, a few roads had a number of modern steam locomotives of considerably greater tonnage-speed capacity than the older power and, in addition, a complement of Diesel-electric switchers which by that time had demonstrated their ability to work "round the clock." The latter were utilized in unraveling yard tie-ups which put the freight tonnage out on the road where it could be moved. It was this small group of locomotives, at most not over 30 per cent of the inventory, that taught American railroad men the meaning of the word "utilization." In brief, the miracle of present-day rail transport is a step in engineering beyond the factors of design, construction, and maintenance, which most railway mechanical engineers have been prone to consider the outer boundaries of their responsibility into the sphere of the "economics of motive-power utilization."

Engineers have long been told that a product is worth no more than what it can be sold for profitably, no matter how high the standard of design and construction. We have now learned, with respect to motive power and rolling stock, that their real value to the owner is their ability to produce an ever-increasing quota of ton-miles of freight and car-miles in passenger service for every mile that is run. The Diesel-electric locomotive has proved that an expensive tool, in its place, can be the cheapest in the long run and has caused more development and research in motive power to be initiated than has anything since the electric locomotive first challenged the right of steam to a monopoly in the hauling of trains.

Elsewhere in this report, descriptions are given in some detail of the major developments in the field of motive power. These descriptions deal, in large part, with factors of design, construction, and, in some cases, maintenance. In these introductory remarks it may be worth while briefly to summarize the developments in the field of utilization for it is in this that the outstanding job of railroading has been done.

Reference to Table 1 will tell most of the story. The operating statistics of freight service have been used to illustrate the point; the statistics of passenger operation are just as revealing.

In October, 1929, a peak month in a peak year, the Class 1 roads produced 110.4 billion gross ton-miles in freight service and had 28,912 steam freight locomotives to draw upon. Actually only 75.3 per cent of these were used, 7097 being out of service for repairs, or stored serviceable. October, before the war, was looked upon as a peak month in freight operation and, after the 4 or 5-week rush was over, the roads could settle down again with plenty of time to restore run-out locomotive mileage. This fact is mentioned only for the purpose of throwing the spotlight on the statistics for 1942, 1943, and 1944. Column 7 of Table 1 shows how traffic increased to a high of over 144 billion gross ton-miles, and column 5 shows that the railroads never had a chance to rest and build up motive-power reserves after the pressure was really put on. In 1929, the peak of usage was 75.3 per cent, heretofore considered a major achievement, whereas the war years required the use of from 85 to 87.8 per cent of the locomotives owned. Only within the past 6 months has there been any sign that the demand for power is being reduced. The 495 stored-serviceable locomotives in July, 1944, represent not only the fact that better utilization is being attained with experience but also that some of the obsolete units are gradually finding their way back to where they belong, i.e., in storage.

Modern motive power has demonstrated beyond all doubt that the older locomotive, regardless of differences of opinion as to what constitutes an old locomotive, can no longer hold up its end in the keen competition of main-line traffic. In this fact is a lesson for those who will be responsible for the motive-power policies of the postwar years.

The major part of this report deals with motive power for the reason that, during 1944, the activity in the car field was mostly in the realm of development work. New passenger-car designs were announced for postwar building. In the freight-car field, interest centered around the prospects of high-speed trucks, roller bearings, lightweight construction, and the use of plywood in refrigerator- and boxcar construction.

EQUIPMENT PROBLEMS OF THE ARMED SERVICES

One of the major problems confronting the Army Service Forces was the supply of railroad cars and motive power for operation in the many theaters of war. In this global war, the Army must be prepared to operate all available transportation facilities in any country in the world. The equipment

[1] Report of Committee RR-6, Survey, Chairman, E. G. Young; members, E. R. Battley, B. S. Cain, K. F. Nystrom, and H. C. Wilcox.
Contributed by the Railroad Division and presented at the Annual Meeting, New York, N. Y., Nov. 27–Dec. 1, 1944, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

existing on most foreign railroads would not be sufficient to handle the increased war traffic, and in numerous areas such equipment has been destroyed or seriously damaged. Obviously, equipment already in use on the many foreign roads could not be relied upon and had to be augmented or replaced before operations could be conducted successfully.

After surveying the contingencies and possible requirements to be satisfied, it developed that equipment had to be provided suitable for adaptation to 6 track gages, 20 coupler arrangements, and 3 braking systems. Weight and clearance restrictions also had to be observed, which in some cases were so extreme as to require special designs not suitable for general use. The actual shipping and setting up of the equipment added further to design problems. It was necessary that shipping space requirements be kept at an absolute minimum and items be knocked down to such weights and sizes as could be handled under adverse conditions without elaborate hoisting or handling equipment. Careful investigations were made to determine the most practical shipping arrangements for locomotives and cars, and designs were altered wherever practical to facilitate handling and erection in the field.

Supplying maintenance parts in any country in the world becomes at once the major problem after equipment is in service. It was recognized that complicated design would increase the number of repair items required and reduce the availability of motive power and cars. For this reason all devices of questionable merit were eliminated in the basic designs. For practical purposes it was desired that all equipment be built to conform to operating and maintenance practice of the individual countries in order that it could be placed in service with a minimum amount of preparation and instruction of the operating and maintenance personnel. It was therefore necessary that railroad representatives of the Allied Nations be consulted during the design of all equipment. This co-operation from the allied agencies has accounted in no small degree for the exceptionally fine performance and adaptability of the railroad equipment in the respective theaters of operation.

The relative life of railroad equipment is generally governed by two factors, namely, operation and maintenance. These factors are usually adverse in military operation and, consequently, it is unnecessary to provide refinements to extend the life of this equipment over a 4 or 5-year period. In the actual manufacture of locomotives and cars, it was necessary to eliminate as far as practical the use of certain high-priority materials. Designs were therefore made flexible enough to permit various substitutions in material specifications during temporary material shortages, without interfering with production schedules. Wherever possible, the use of certain high-priority materials, such as copper, tin, and special alloy steels, was eliminated.

AMERICAN STEAM LOCOMOTIVES

The 4-8-4 class of locomotive for heavy and fast passenger and freight services held the lead for popularity among the locomotives built during the period covered by this survey. Items 1 to 10 in Table 2 give particulars of a number of units of this class. A study of the dimensional characteristics of this group of locomotives leads one to recall the address delivered by Brig. Gen. C. D. Young at the A.S.M.E. Railroad Division session of Dec. 1, 1943, in which he called for a greater degree of standardization in steam-locomotive design and construction to the end that greater economies in first costs would be procured. On

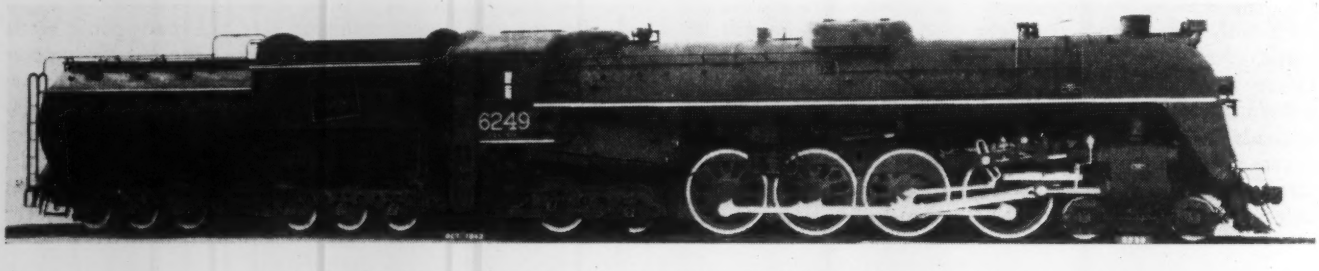


FIG. 1 4-8-4 CANADIAN NATIONAL, BUILT BY MONTREAL LOCOMOTIVE WORKS

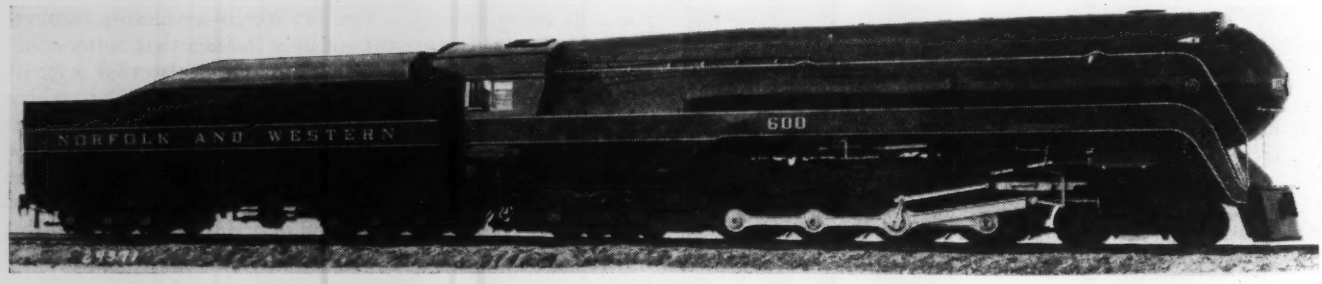


FIG. 2 4-8-4 NORFOLK AND WESTERN, PASSENGER AND FAST FREIGHT SERVICE
(Built at Roanoke Shops of company.)

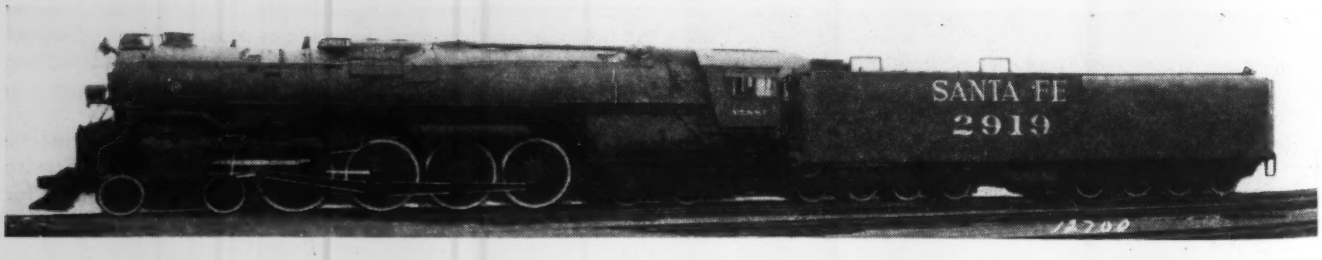


FIG. 3 4-8-4 SANTA FE, BUILT BY BALDWIN LOCOMOTIVE WORKS

TABLE 1 SELECTED STATISTICS OF MOTIVE POWER AND FREIGHT TRAIN PERFORMANCE

	Total freight locomotives	Unserviceable	Stored serviceable	Active locomotives	Per cent active to total	Locomotive-miles, total (000)	Gross ton-miles (000,000)	Freight train-miles (000)	Freight car-miles (000,000)
1929	1	2	3	4	5	6	7	8	9
October	28912	4417	2680	21755	75.3	64756	110444	56748	2785
1942									
February	21841	3238	916	17687	80.9	55030	100489	48030	2341
October	22027	2344	340	19343	87.8	70461	141880	60717	3155
1943									
January	21974	2509	352	19113	86.9	67152	126930	57966	2790
February	22048	2629	297	19130	86.7	62962	121919	54246	2660
March	22075	2676	282	19117	86.6	70103	137148	60344	3028
April	22030	2585	283	19162	87.0	67524	134882	58295	3001
May	22067	2593	364	19110	86.5	69491	141453	59801	3131
June	22096	2595	376	19125	86.5	66071	132549	57110	2959
July	22083	2471	406	19206	86.9	69311	143568	59758	3151
August	22031	2677	395	18959	86.0	69296	144817	59711	3183
September	22107	2666	355	19086	86.3	67680	140771	58373	3110
October	22037	2703	335	18999	86.2	70084	145076	60355	3185
November	22205	2740	308	19157	86.2	66448	133356	57338	2937
December	22259	2601	315	19343	86.8	67433	133254	58325	2918
1944									
January	22351	2666	310	19375	86.6	68927	137118	59489	3020
February	22341	2808	307	19226	86.6	66547	132795	57367	2913
March	22291	2609	264	19418	87.1	70993	142638	61306	3165
April	22265	2814	341	19110	85.8	66868	137350	57832	3043
May	22316	2783	436	19097	85.5	69279	144110	59894	3167
June	22199	2682	498	19019	85.6	66136	138663	57179	3044
July	22253	2804	495	18954	85.1	67478	141533	58315	3115

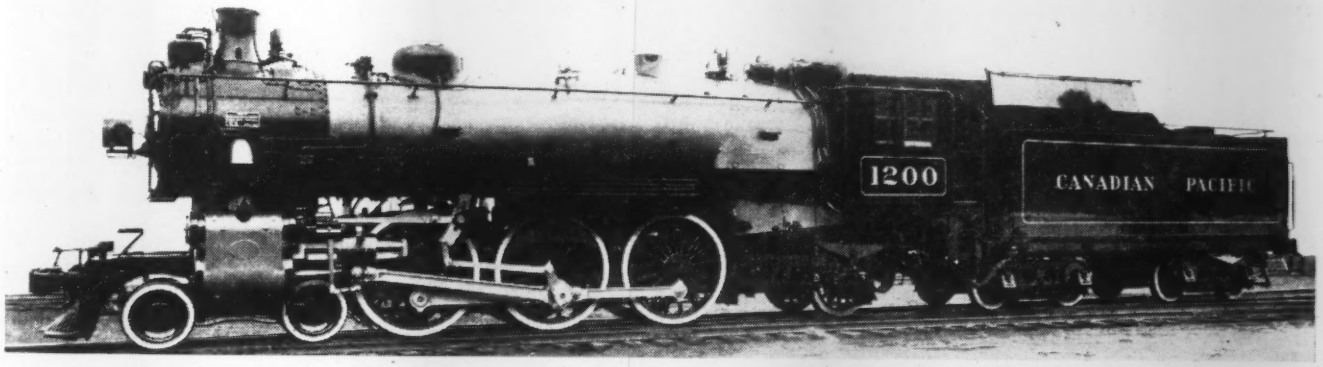


FIG. 4 4-6-2 CANADIAN PACIFIC EXPERIMENTAL LOCOMOTIVE, LIGHT FREIGHT AND PASSENGER SERVICE
(Built at company shops.)

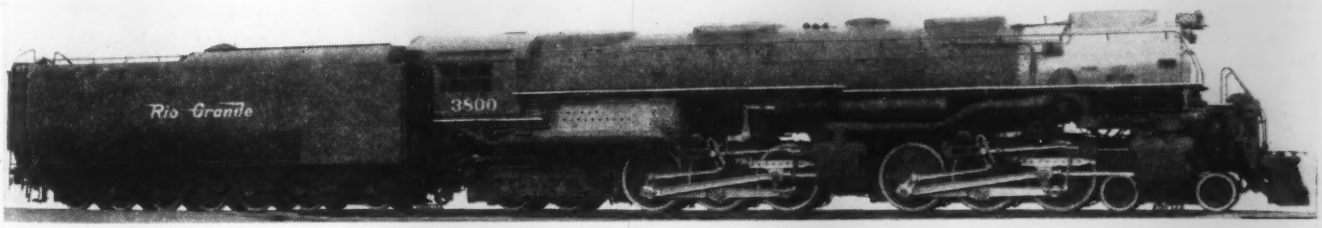


FIG. 5 4-6-6-4 D.&R.G.W., BUILT BY AMERICAN LOCOMOTIVE COMPANY

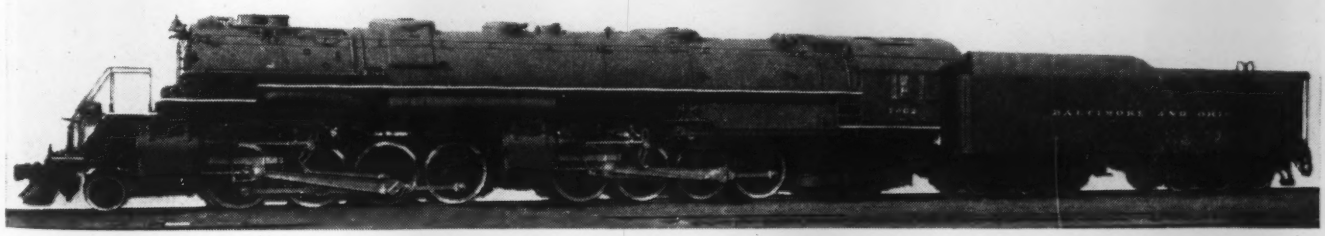


FIG. 6 2-8-8-4 BALTIMORE & OHIO, BUILT BY BALDWIN LOCOMOTIVE WORKS

TABLE 2 STEAM LOCOMOTIVES FOR SERVICE IN U.S.A. AND CANADA

Item	Builder	Owner	Wheel arrangement	Service	Cylinders: No.	Cylinders: Diam	Cylinders: Stroke	Boiler pressure	Driver diam	Weight on drivers	Total weight, locomotive in road order	Heating surfaces: Evaporative	Heating surfaces: Superheater	Heating surfaces: Grate total	Grate area	Tender data: Wheels	Tender data: Fuel	Tender data: Water	Tender data: Weight 2/3 loaded	Notes
1	ALCO	Lehigh Valley	4-8-4	F	2	26	32	255	70	274500	451000	5376	2095	7471	88.3	12	30	20000	304400	
2	BLW	Mo. Pac.	4-8-4	F	2	26	30	285	73	280000	496000	5306	2200	7506	106.0	12	20	19350	286600	
3	Lima	Cent. of Ga.	4-8-4	F—P	2	27	30	250	73 1/2	260000	447200	4705	2059	6764	90.2	8	21	13000	196640	
4	MLW	Can. Nat.	4-8-4	F—P	2	25 1/2	30	250	73	246100	400300	4080	1835	5915	84.3	12	18	14000	226900	
5	BLW	Frisco	4-8-4	F—P	2	28	31	255	74	286900	479300	5313	2366	7679	108.0	12	7000	24500	369690	Oil burner
6	ALCO	Rock Island	4-8-4	F	2	26	32	270	74	280000	467000	4573	1438	6011	96.3	12	25	20000	301800	
7	ALCO	NC & St. L	4-8-4	F—P	2	25	30	250	70	228000	399000	4203	1721	5924	77.3	12	16	15000	....	
8	Co. Shops	N & W	4-8-4	F—P	2	27	32	275	70	288000	494000	5271	2177	7448	107.7	12	26	22000	301000	
9	BLW	No. Pac.	4-8-4	F	2	28	31	260	77	295000	508500	4673	....	...	115.0	14	..	...	....	
10	BLW	Santa Fe	4-8-4	F—P	2	28	32	300	80	293860	510150	..	..	...	...	..	..	...	....	
11	ALCO	C & O	2-8-4	F	2	26	34	245	69	292000	460000	4770	1949	6719	90.3	12	30	21000	312800	
12	BLW	L & HR	4-8-2	F	2	28	31	240	73	268500	419500	4511	1887	5398	79.0	14	21	23000	324250	
13	Co. Shops	Wabash	4-6-4	F—P	2	26	28	220	80	196390	374690	4225	1051	5276	70.9	8	16	12000	....	Conversion
14	Co. Shops	Can. Pac.	4-6-2	F—P	2	20	28	250	70	150000	231000	2576	744	3320	45.6	8	14.5	9600	148700	
15	BLW	Bessemer	2-10-4	F	2	31	32	250	64	371359	523600	5912	2487	8399	106.5	12	25	23000	300500	
16	BLW	Santa Fe	2-10-4	F	2	30	32													
17	Co. Shops	Penna.	2-10-4	F	2	29	34													
18	ALCO	Rio Grande	4-6-6-4	F	4	21	32	280	69	405500	630000	4795	2162	6957	132.2	14	28	25000	348000	
19	Co. Shops	N & W	2-6-6-4	F—P	4	24	30	300	70	432350	573000	6639	2703	9342	122.0	12	26	22000	301000	
20	BLW	IM & IR	2-8-8-4	F	4	26	32	240	63	565000	699700	6758	2770	9528	125.0	14	26	25000	436635	
21	BLW	B & O	2-8-8-4	F	4	24	32	235	64	485000	628700	5298	2118	7416	117.5	12	25	22000	304000	
22	Lima	Virginia	2-6-6-6	F	4	22 1/2	33	260	67	495000	750000	7240	3186	10426	135.0	14	25	26500	353000	Under construction

NOTE:
F—Freight.
P—Passenger.
Weights expressed in pounds. Tender capacities expressed: fuel in tons (2000 lb); water in U. S. gallons.
Heating surfaces and grate areas expressed in square feet.
Boiler pressures expressed in pounds per square inch.
Wheel diameters, gage, cylinder dimensions expressed in inches.
Speed expressed in miles per hour.
ALCO—American Locomotive Company.
BLW—Baldwin Locomotive Works.
Lima—Lima Locomotive Works.
MLW—Montreal Locomotive Works.

TABLE 3 STEAM LOCOMOTIVES, FOREIGN-BUILT AND FOR FOREIGN SERVICE

Item	Nationality of builders	Owner	Wheel arrangement	Service	Cylinders: No.	Cylinders: Diam	Cylinders: Stroke	Boiler pressure	Driver diam	Weight on drivers	Total weight, locomotive in road order	Heating surfaces: Evaporative	Heating surfaces: Superheater	Heating surfaces: Grate total	Grate area	Track gage	Tender data: Wheels	Tender data: Fuel	Tender data: Water	Tender data: Weight 2/3 loaded	Notes
1	British	British W.D.	2-10-0	F	2	19	28	225	56 1/2	149900	200260	1951	423	2374	50	56 1/2	8	10	6000	100820	War standard
2	German	German W.D.	2-10-0	F	2	23 5/8	26	227	55 1/8	165000	190000	1910	684	2594	43	56 1/2	8	9	6900	106800	War standard
3	British	LNER	4-6-2	F—P	3	19	26	225	74	147840	219520	2430	680	3110	41 1/4	56 1/2	6	8 1/2	5050	97000	Conversion
4	Spanish	Span. Govt.	2-8-0	F—P	2	24	25 5/8	185	61 3/8	144860	173680	...	...	....	32.4	66	6	6 3/4	3700	65800	
5	Canadian	Indian State	2-8-2	F	2	21	28	200	60	141000	198000	2155	630	2785	47	66	8	14 1/2	5400	99000	War standard
6	Clyde Eng.	New South Wales	4-6-2	P	2	21 1/2	26	245	69	150000	252000	2614	...	..	47	56 1/2	8	15 3/4	8400	155167	Oil-burner
7	British	African Rys.	4-6-2	F—P	2	18	24	180	54	76920	129920	1125	260	1385	26	42	8	2160	4800	89370	War standard
8	Co. Shops	West, Austral.	4-8-2	F—P	2	19	24	200	48	116500	168600	1673	...	..	40	42	8	10	4200	80167	
9	British	British W.D.	4-8-2-2-8-4	F—P	4	19	24	180	45 1/2	238000	385000	2540	470	3010	51.3	Meter	..	13	7200	....	
10	British	British W.D.	2-8-2-2-8-2	F—P	4	19	24	180	45 1/2	233000	335000	2540	470	2010	51.3	42	..	10	5500	....	Wood burner
11	British	Vicicongo	2-8-2	F	2	15 3/4	17 3/4	170	37 13/32	69800	94775	968	...	968	24.2	35 5/8	8	247CF	1320	22000	Wood burner

NOTE:
F—Freight.
P—Passenger.
Weights expressed in pounds.
Heating surfaces and grate areas expressed in square feet.
Boiler pressures expressed in pounds per square inch.
Wheel diameters and track gage, cylinder dimensions expressed in inches.
Speed expressed in miles per hour.

many roads these locomotives are being operated in pooled passenger and freight service with resultant economies due to high mileages and high utilization afforded by such operating methods.

The 4-8-4 design covered by Fig. 2 and item 8, is a dual-purpose unit for passenger and fast freight service, and was built in the Roanoke shops of the N.&W. Roller-bearing applications include, not only all axles on the engine and tender, but also the wrist- and crankpins and the valve gear. The mechanical lubricating system serves 220 points. Drawbar horsepower is calculated at 4250 hp maximum, with a top speed of 90 mph. Maintenance costs, including a class-3 shopping, are reported at 9.95 cents per mile by the owners. The first five of these engines to be built averaged 238,180 miles before the first shopping for classified repairs became necessary.

Item 12, Table 2, describes a 4-8-2 built by Baldwin for operation on the Lehigh & Hudson River between Allentown, Pa., and Maybrook, N. Y. The large-capacity tender enables the locomotive to make its assigned run, a distance of approximately 100 miles, without intermediate stops for fuel or water.

The Canadian Pacific has built, for experimental purposes, two relatively small Pacific-type locomotives, item 14 of Table 2 and Fig. 4, as replacement motive power for several hundred outmoded light freight and passenger units. To meet the severe weight limitations involved, cast-steel cylinders and aluminum sheets and shapes in the upper portion of the cab were employed. Some monel metal rigid stay bolts in place of flexible bolts were used for experimental purposes: It will be noted that the conventional steam dome is lacking in these locomotives. An internal steam collector pipe replaces the dome, a general practice now employed on all new Canadian Pacific locomotives.

Several designs in the 2-10-4 wheel-arrangement class were produced. A large number were produced by the Pennsylvania Railroad in its Altoona shops and, while not a new design, the locomotive represents an appreciable concentration of power in a single two-cylinder engine. The 2-10-4 design of the Bessemer, item 15 of Table 2, built by Baldwin, is in heavy coal- and ore-haulage service between the Pittsburgh steel district and the Lake Erie terminus of the line at Conneaut. It is probably the most powerful of this wheel arrangement in existence and duplicates essentially those built in 1936 for this road by Baldwin.

Item 19 of Table 2 covers an outstanding 2-6-6-4 design built by the Norfolk & Western in its Roanoke shops. Roller bearings and mechanical lubrication are used extensively in these units. All axles, leading, driving, trailer, and tender, are roller-bearing-equipped, as is the valve motion also. A total of 238 points is served from the mechanical lubricating system. A maximum sustained drawbar horsepower of 6300 at 45 mph has been recorded in dynamometer tests. Water evaporation of 116,055 lb per hr, and a sustained combustion rate of 7 tons of coal per hr have been recorded in road tests. Maintenance costs of 21.1 cents per mile, including shopping costs, are being reported for this locomotive in N.&W. service. Suitable for high-speed service, maximum utilization is being secured by using this motive power in fast and slow freight, passenger and troop-train services.

The articulated Mallets of the B.&O., item 21 of table 2, are being used to handle heavy-tonnage freight over the West End-Cumberland Division, one of the heaviest operations on a main-line railroad in the east. Maximum compensated grades of 2.52 per cent, an average grade of 2.36 per cent (compensated) 9 miles in length and 12 deg curvature, are encountered in this territory. These locomotives are the most powerful in B.&O. service and rank among the most powerful steam locomotives in use anywhere in the country. Dynamometer tests have shown a drawbar-horsepower rating of somewhat over 6000 at 45 mph. Coal consumptions varying between 2.65 and 4.59 lb per drawbar hp-hr, with the locomotive working are reported from road tests. Twenty of the locomotives have been delivered, and an additional ten are under construction. Item 22 in Table 2 gives statistics on a 2-6-6-6 Mallet, eight of which are under construction by Lima for service on the Virginian. The design, in general, is similar to those built by Lima for the C.&O., as reported in the 1941-1942 survey of this committee. Notable in the Virginian locomotive is the driving-axle loading, 82,500 lb per axle, as compared with 78,500 for the C.&O. design. With a combined evaporative heating and superheating surface of 10,426 sq ft, these locomotives should indicate considerably over 7000 hp at speed.

The Pennsylvania placed in service a trial locomotive with a 4-6-4-4 wheel arrangement (known as the Q-1 class) in which the forward engine drives three coupled axles, and the rear engine (two cylinders placed back of the last pair of drivers) drives two coupled axles. The Q-2 design, which is an outgrowth of trials on the Q-1 locomotive, is a four-cylinder engine with a 4-4-6-4 wheel arrangement. The rear cylinders are placed between the second and third pair of drivers instead of at the rear of the last driver, as was the case with the Q-1 design. A boiler pressure of 300 psi, and an evaporating capacity of 138,000 lb of steam per hr will place this design among the most powerful steam locomotives, at speed, ever constructed. Twenty-six of these units are being constructed in the railroad's shops. It should be noted that the Q-2 cylinder and drive-wheel arrangement is not new. A 2-4-6-2 four-cylinder engine of approximately 3000-hp rating was built for freight service during the past decade to operate on the Paris-Lyons-Mediterranean Railway in France.

The initial application of the Franklin system of steam distribution on P.R.R. locomotive 5399 (reported in December, 1941) is still maintaining its high standard of performance in high-speed service, having run approximately 360,000 miles to June, 1944. The two P.R.R. locomotives of the T-1 class numbers 6110 and 6111 with the Franklin system of steam distribution have been continuously running in fast service since the summer of 1942.

Missouri Pacific engine No. 6001, originally a three-cylinder locomotive, was rebuilt to two cylinders equipped with the Franklin system of steam distribution and entered passenger service in November, 1942. It is of the 4-6-2 type and, as reconstructed, cylinders are 27 in. × 28 in., drive wheels 73 in. diam, steam pressure 200 psi, weight on drivers 187,785 lb, and total weight of engine 314,755 lb. Poppet-valve engine No. 6001 has made up 35 min on a 14-car train while consuming 1035 gal of fuel oil, as compared to piston-valve engine No. 6624, making scheduled time with 11 cars burning 1356 gal of fuel oil. This is on a 144-mile run and represents a saving in fuel of 40 per cent per car-mile.

The year 1943 saw the completion of an experiment with the first steam-turbine locomotive in the United States. Designed by Union Pacific, General Electric, and Babcock & Wilcox, this consisted of two duplicate units, each with a 1500-psi steamotive boiler, steam-turbine-electric drive, and an air-cooled condenser. The total rating of the two units was 5000 hp. Each unit ran an average of 49,197 miles with a total of over 66,000,000 gross ton-miles in revenue service on the Union Pacific, New York Central, and Great Northern. The locomotive handled 50 scheduled passenger trains, 43 freight trains, 4 test trains, and 4 specials. Of the 50 scheduled passenger trains, 49 were handled in less than the scheduled running time, making up a total of 28 hr 17 min. One train was relinquished because of a locomotive failure. Each steam power plant ran an average of 4161 hr, of which about one half was test and the other half railroad operation.

The boiler produced 12.8 lb of steam per lb of fuel oil at 45,000 lb per hr steam flow. As originally built, the boilers showed local overheating at certain parts of the furnace tubes and also a water carry-over of 1.8 per cent. Both troubles were overcome and a slightly modified boiler operated 3430 hr in the

locomotive without any failure and with a maximum carry-over of 0.25 per cent. The other boiler suffered periodic failures as a result of one circuit having been accidentally operated without water. If this circuit had been replaced after the accident, the failures would not have occurred. The automatic control worked well.

With 45,000 lb per hr boiler steam flow at 900 F, 1450 psi, and atmospheric turbine-exhaust pressure, the output of each turbine gear was 3100 hp, or a total of 6200 hp. The high-pressure turbines were rebuilt to improve efficiency, correct oil leakage, and some minor details. They operated satisfactorily and showed that high-pressure high-speed turbines are entirely practical in locomotive service. The full-load fuel rate was 1.13 lb of bunker C oil per hp-hr.

A great deal of experimental work was done on the condensing system to prevent freezing and insure drainage and air-removal under all conditions. All problems were finally solved, and the system was checked in service at high ambient temperatures and down to —25 F. The data thus obtained showed that air condensers with much lower steam-pressure drops and much greater resistance to freezing could be built. One quarter of the condensers on each unit were changed to the new type and operated satisfactorily. At full load these two units required 1500 tons of air per hr to cool the condensers. It may require anything up to 670 hp to take on and discharge this air with a locomotive speed of 80 mph. Condenser-inlet and fan-outlet louvers were designed on the basis of wind-tunnel tests and were successful in reducing this power loss to a much lower and negligible amount.

Operation of the locomotive mechanically and of the electric brake were satisfactory. In 1943, it was decided that those first units were too complicated and too difficult to operate and maintain, particularly in wartime, because of their great quantity of special and developmental equipment. Also, sufficient experience had been obtained to permit the design of much simpler units with better over-all economy. The locomotive was therefore taken out of service and dismantled.

FOREIGN STEAM LOCOMOTIVES

In the foreign field, particularly in belligerent countries, locomotive design and construction have been devoted largely

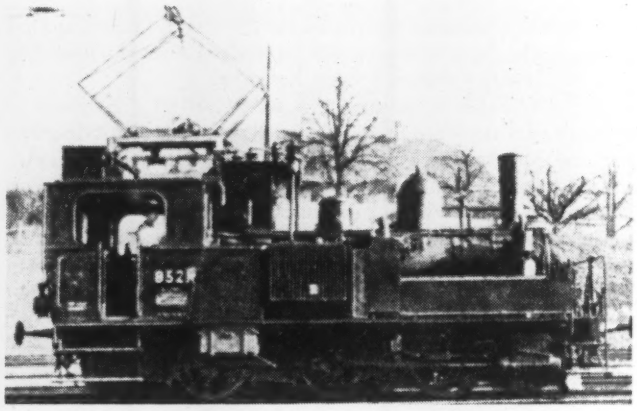
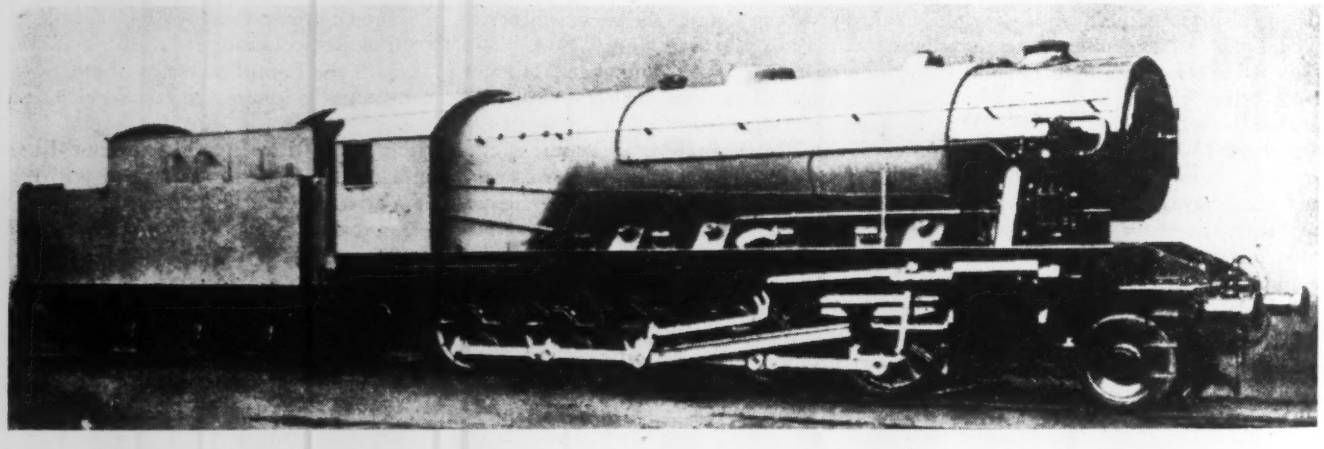


FIG. 7 "ELECTRO-STEAM" LOCOMOTIVE CONVERTED BY SWISS RAILWAYS FROM COAL-BURNING TO "ELECTRICALLY" FIRED OPERATION



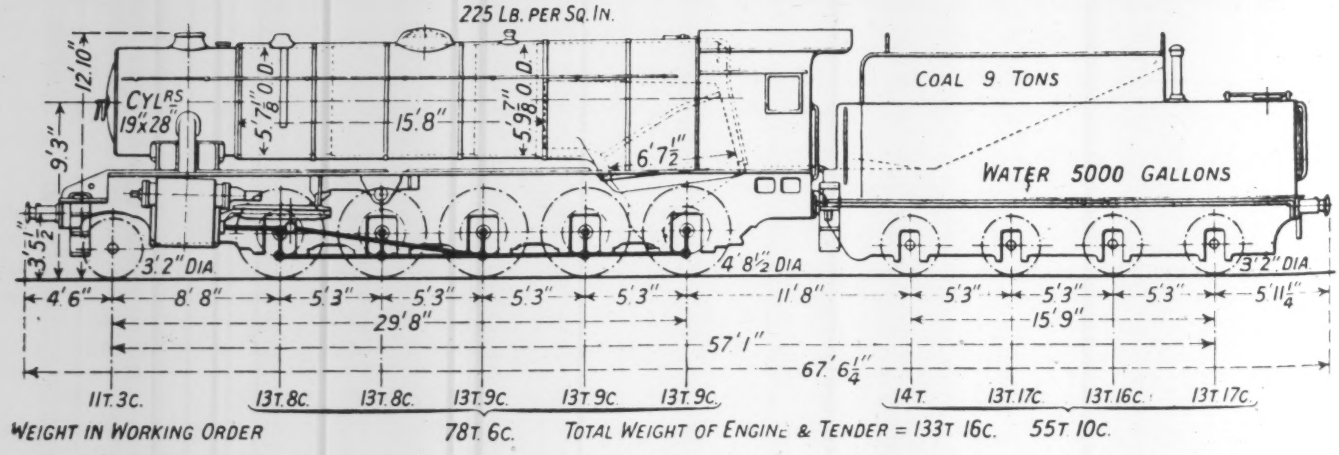
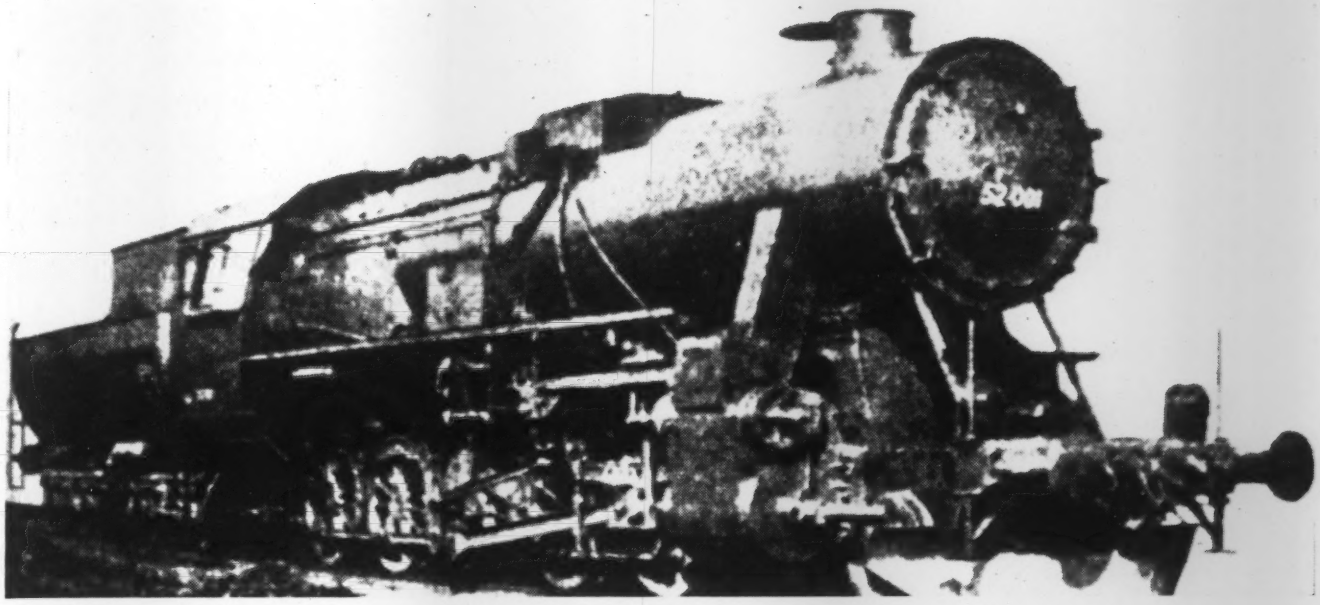


Diagram giving principal dimensions and axle loads of the 2-10-0 austerity locomotive

FIG. 8 2-10-0 BRITISH-BUILT "AUSTERITY" LOCOMOTIVE



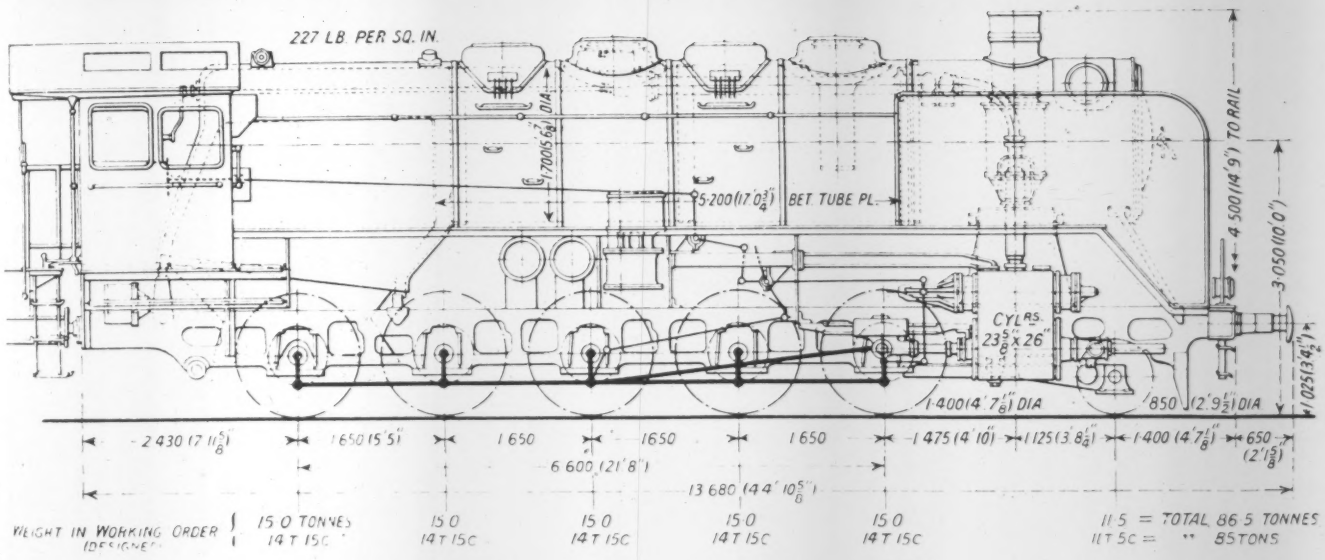


FIG. 9 2-10-0 GERMAN-BUILT "AUSTERITY" LOCOMOTIVE

to the production of simplified standard designs capable of being mass-produced quickly and with the use of a minimum of strategic materials and labor. In the nonbelligerent countries, the emphasis has been placed on the conservation of imported materials in locomotive construction and operation. Illustrative of this is the conversion of a number of small steam switching locomotives on the Swiss railways from coal-burning to electrically "fired" operation. Steam is raised by the use of electric energy, taken from the overhead contact system of electrified lines, in special evaporators wherein the water tubes constitute the resistance-heating elements. The resulting "electrosteam" unit (Fig. 7), a steam locomotive with a pantograph, is an anomaly indeed.

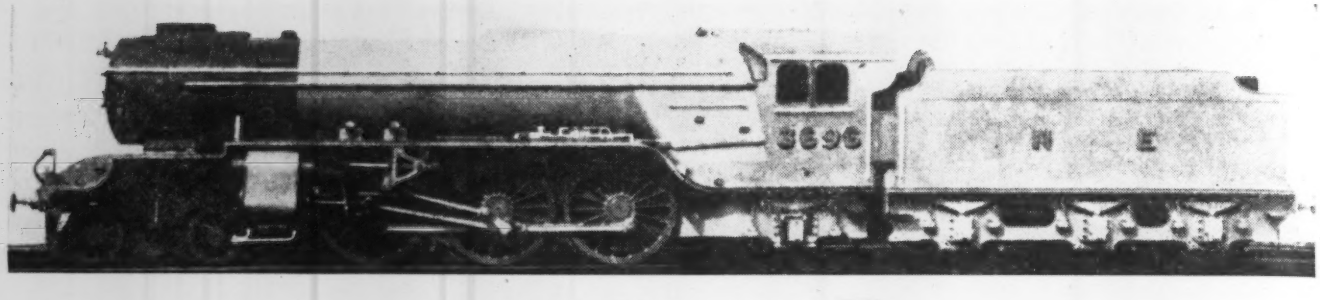
Among the several standard steam-locomotive designs evolved for the War Departments of the United States and Great Britain for overseas service, the so-called "Austerity" Consolidation types as produced by American and British builders, apparently to the same general specifications, are interesting.

Of special interest is the 2-10-0 "war standard" brought out by the British for use on the railroads of Great Britain. Low axle loadings (30,000 lb per driving axle) are a feature of this design. The use of these marks the initial employment of the Decapod type in Great Britain, although ten-coupled (0-10-0) units had been tried experimentally some 20 and 40 years ago and discarded as unsatisfactory after initial trials. Fig. 8 and item 1 of Table 3 give details on this locomotive.

The Germans also have brought out a "war standard" design (Fig. 9), built to conserve strategic materials and characterized by a 2-10-0 wheel arrangement with slightly heavier axle loadings than those found in the British design with similar wheel arrangement. Die-forging, with a consequent saving in high-grade steel, has been employed extensively in the fabrication of reciprocating components, brake rigging, etc. The British and German models are compared in items 1 and 2 of Table 3.

The three-cylinder 4-6-2 locomotives, Fig. 10, built for the London and Northeastern, are the result of experience obtained with a number of 2-8-2 units built in 1936, and later converted to 4-6-2 for mixed-traffic freight and passenger service. The two outside cylinders drive the center pair of coupled wheels, while the inside cylinder drives on the axle of the leading pair of drivers. An independent Walschaert valve gear is employed to actuate the valve for the center cylinder. Additional particulars are given in Table 3, under item 3.

Locomotive builders in Spain, given impetus because of the preoccupation with matters pertaining to the war on the part of



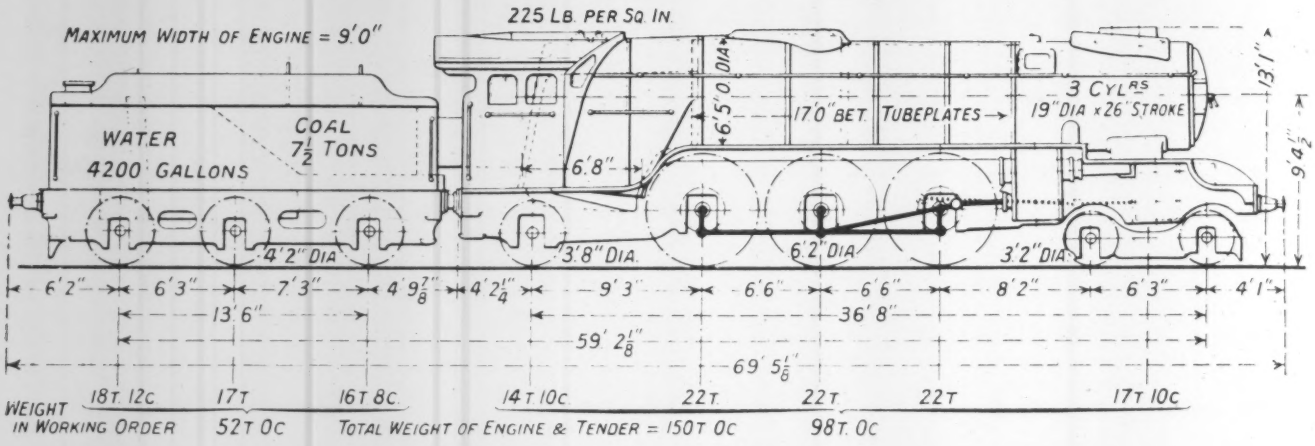


FIG. 10 4-6-2 LONDON AND NORTHEASTERN FOR MIXED TRAFFIC SERVICE

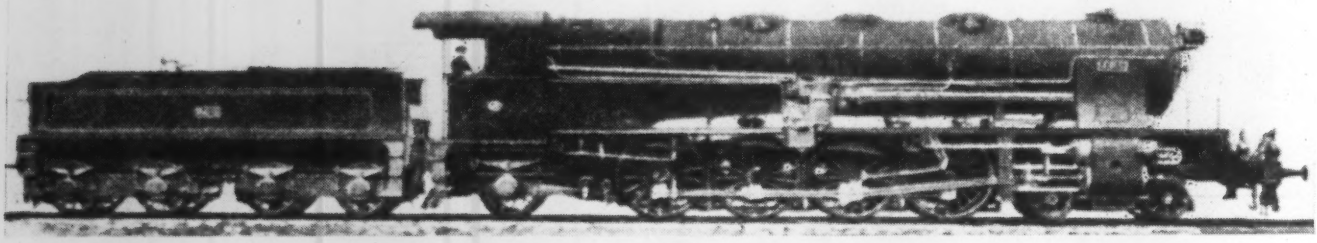


FIG. 11 4-8-2 MOUNTAIN TYPE BUILT IN SPAIN

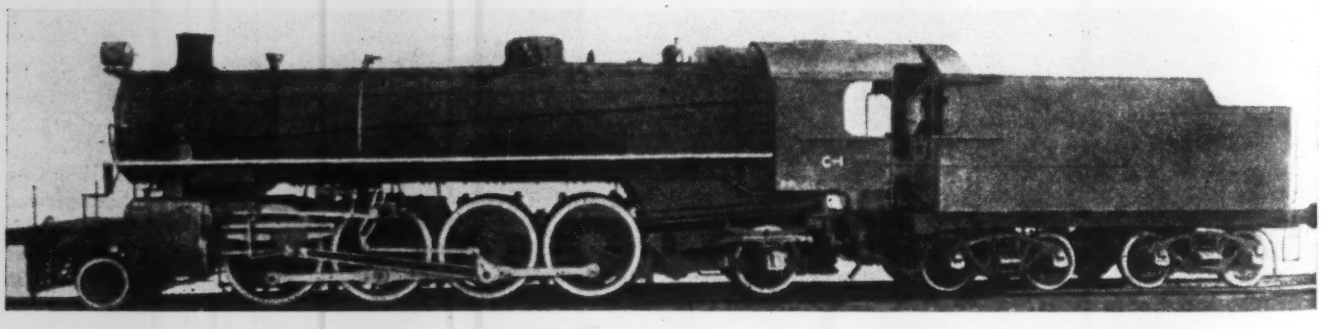
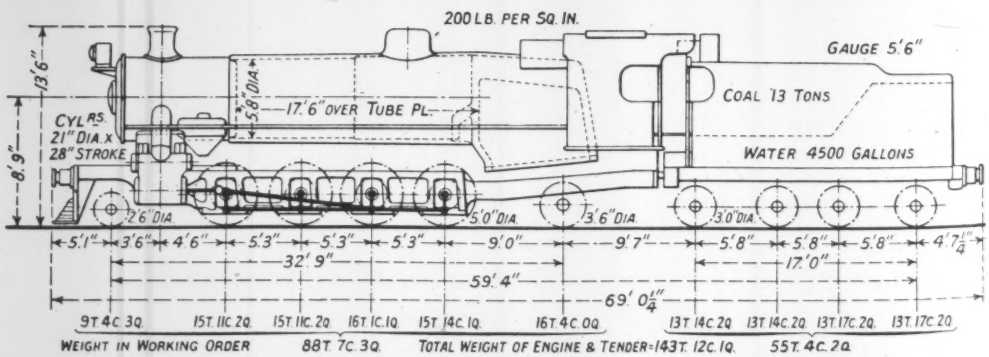


FIG. 12 2-8-2 CANADIAN-BUILT LOCOMOTIVE FOR INDIAN STATE RAILWAYS



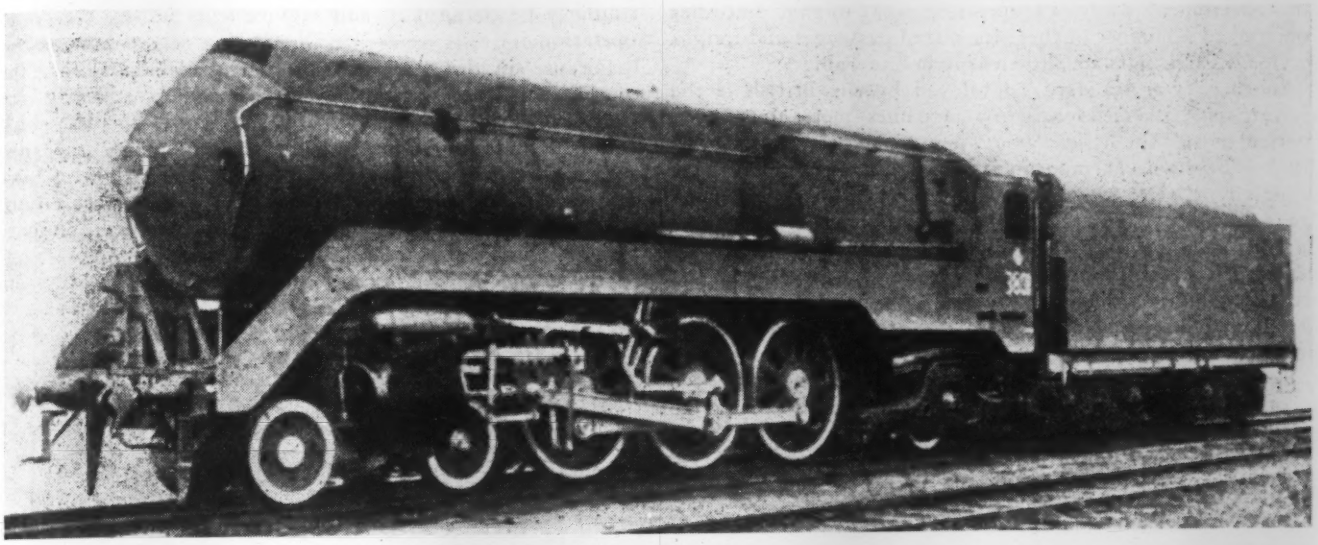


FIG. 13 4-6-2 BRITISH-BUILT STREAMLINED UNIT FOR OPERATION IN NEW SOUTH WALES

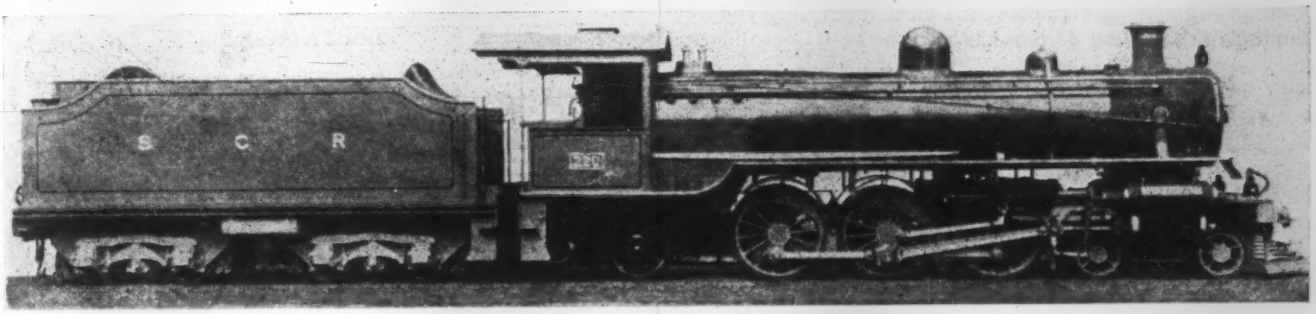


FIG. 14 4-6-2 BUILT BY BRITISH MINISTRY OF SUPPLY IN ENGLAND FOR SERVICE IN AFRICA

countries which formerly supplied the Spanish market, have produced a number of new designs characteristically Spanish in appearance. Outstanding among these is the 4-8-2 Mountain type built for fast heavy service in the mountainous regions of Northern Spain, Fig. 11. Another design which has been built in relatively large quantities is the Consolidation, details of which are given as item 4 in Table 3.

Fig. 12 shows the Canadian-built locomotives constructed for the Indian State Railways. These locomotives are quite similar to those built in large quantities by locomotive builders in the United States for overseas service. The locomotive is further described under item 5 in Table 3.

Fig. 13 and item 6 in Table 3 describe a British-built locomotive that could pass for an "American-built for American operation" streamlined unit, were it not for the coupler, buffers, and lack of a pilot. American practice in constructional details, as well as in the matter of appearance, has been followed throughout. Cast-steel locomotive bed, Boxpok wheel centers, roller bearings on all axles, delta trailing-truck frame, and a boiler pressure of 245 psi are some of the features characterizing this unit. The locomotive is built to operate on the New South Wales government lines in Australia.

A further illustration of the extent to which standardization of motive power by roads, which formerly had their own peculiarities of design, has been promoted by the exigencies of war, is the 4-6-2 locomotive (Fig. 14, and item 7 in Table 3) built by the British Ministry of Supply for service on any of the 42-in-gage lines in the African Sudan, Nigeria, Gold Coast, Congo, and Rhodesia. Built to use oil they may be converted readily to burn coal.

The popularity of the 4-8-2 class of locomotives is not confined to the heavier standard-gage sizes. The Western Austral-

ian Government Railways operating a 42-in-gage line, has constructed a number of these for mixed passenger and freight service. Particulars are shown as item 8 in Table 3.

Another "war standard" developed by the British is the Garratt type, designed for narrow-gage lines (meter and 42 in.), particularly for the African area. The meter-gage version has a 4-8-2 + 2-8-4 wheel arrangement, while that for the wider gage is built with a 2-8-2 + 2-8-2 wheel arrangement. Both units are essentially identical, except that the former accommodates greater fuel and water supplies. Both locomotives are designed to operate on 60-lb rails and, as such, are the largest steam locomotives yet built to operate on narrow-gage track. Detail characteristics for the two units are given under items 9 and 10 in Table 3.

Reminiscent of the early American woodburners is the 2-8-2 locomotive built in England for service in the Belgian Congo on the odd gage of 2 ft $11\frac{5}{8}$ in. The boiler is designed to burn locally found wood fuel with a heating value of but 7940 Btu per lb. Item 11 in Table 3 gives further particulars.

STEAM LOCOMOTIVES FOR U. S. ARMY

In collaboration with the locomotive builders, three basic steam locomotive designs were developed for the U. S. Army. From an engineering viewpoint the most interesting and outstanding of these three designs has been the 2-8-0 Consolidation

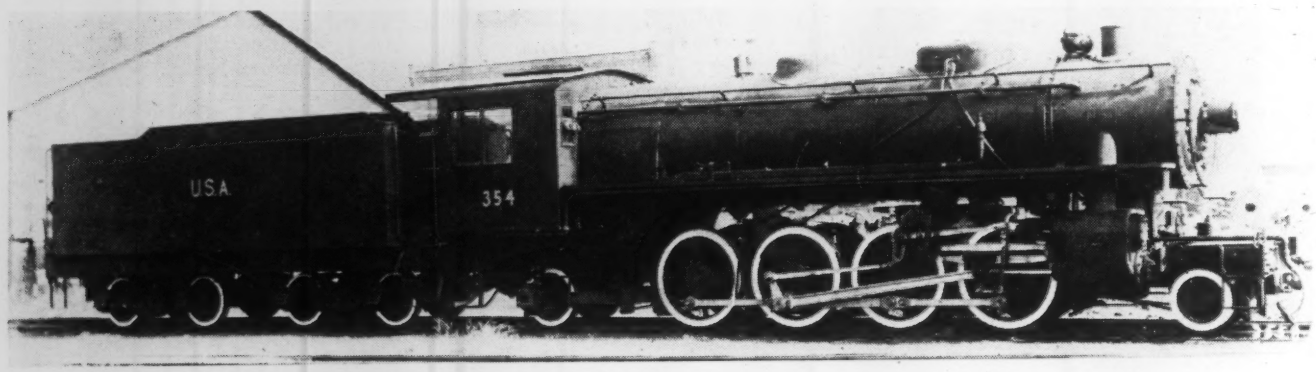


FIG. 16 2-8-2 NARROW GAGE FOR U. S. ARMY; DAVENPORT

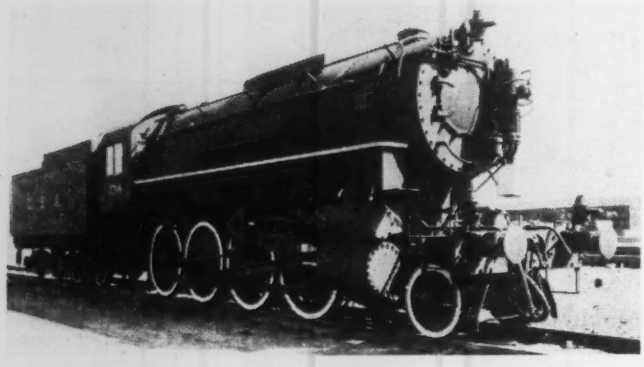


FIG. 15 2-8-0 STANDARD GAGE FOR U. S. ARMY

type. This locomotive was developed primarily for use on standard-gage track, but can be built for either 60-in. or 66-in. gage without making major changes. This engine, as shown in Fig. 15, is unusually compact. Of special interest is the fact that it requires only 1 cu ft of shipping space for each 8 lb of tractive force, whereas usual modern railroad locomotives produce only 6 lb tractive force per cu ft of shipping space. This reduction in size makes available approximately 1300 cu ft of shipping space per locomotive. While designed primarily for side buffers and hook couplers, no major changes are necessary to apply any other type coupler. Braking equipment can similarly be changed to suit requirements in any theater of operation.

For use on the many narrow-gage roads throughout the world, it was necessary to develop a locomotive having very light axle loads. A 2-8-2 type was designed, Fig. 16, which could be built for 36-in., $39\frac{3}{8}$-in. (meter) and 42-in. gages. By changing tire spacing, wheels, and brake beams, this locomotive can be built for either meter or 42-in. gages. It is, therefore, practical to change to either meter or 42-in. gage

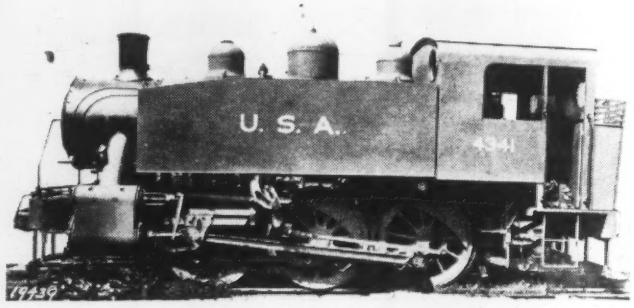


FIG. 17 0-6-0 SIDE-TANK STANDARD-GAGE LOCOMOTIVE FOR U. S. ARMY; VULCAN

TABLE 4 CHARACTERISTICS OF STEAM LOCOMOTIVES OF U. S. ARMY

	2-8-0 standard gage	2-8-2 narrow gage	0-6-0 standard gage
Cylinders, in.	19 × 26	16 × 24	$16\frac{1}{2}$ × 24
Pressure, psi	225	185	210
Driving-wheel diameter, in.	57	48	54
Heating surface, sq ft:			
Firebox and arch tubes	143	115	86
Flues	1622	1256	790
Total	1765	1371	876
Superheater	471	374	None
Grate area	41	27.6	19.4
Wheelbase, ft-in.:			
Engine	23–3	28–3	10–0
Engine and tender	51–$7\frac{3}{4}$	54–3	....
Weights (loaded), lb:			
Drivers	140000	80000	100650
Engine truck	21000	18000	.....
Trailer truck	.....	20000	.....
Total engine	161000	118000	106500
Total tender	115500	96000	Side tanks
Total engine and tender	276000	214000	.....
Water capacity, U. S. gal.	6500	5000	1200
Coal capacity, tons	10	9	2500
Tractive force, lb	31500	201000	21630

in the course of manufacture without seriously altering material requirements or production schedules. With this design, it is possible to have a relatively small number of locomotives in process or erection and yet protect requirements on

the many narrow gages. For 36-in-gage conversions, it is necessary to make additional changes to the frame.

To complete the complement of steam locomotives, a small general-purpose standard-gage locomotive was required. An 0-6-0 side-tank engine, Fig. 17, was developed primarily for yard or terminal service. This type locomotive has been arranged for either foreign or domestic service. It is used in domestic service for general switching at the larger Army depots. This type locomotive is frequently placed in road operation in foreign countries, and, consequently, for overseas operation has been built with a 6-in. higher driving wheel. Other than this wheel difference and I.C.C. safety appliances, the foreign and domestic locomotives are identical in design.

A brief summary of the more important data on these three steam locomotives is given in Table 4.

ELECTRIC LOCOMOTIVES

The 1-C + C-1 3000-v locomotives, supplied for the Sorocabana Railway (Brazil), are noteworthy in that they are the most powerful narrow-gage (meter) electric locomotives yet built. Each locomotive has a continuous rating of 1910 hp and a 1-hr rating of 2195 hp. The locomotives have a total weight of 143 tons with individual driving-axle loading of 39,666 lb. Operation of an 87-mile section of the Sorocabana was started in June, 1944, with these locomotives. A total of twenty of these units was supplied, ten by the General Electric Company, and ten by the Westinghouse & Electric Manufacturing Co., with mechanical portions for all twenty built by General Electric. Most of the principal pieces of equipment such as traction motors, motor-generator sets (used for auxiliary-power supply and regenerative braking excitation), pantographs, high-speed circuit breakers, are interchangeable between the two groups of locomotives. These locomotives are noteworthy also in that the mechanical portions are of all-welded construction, the guiding-truck and driving-wheel frames being weldments fabricated from rolled plates and shapes, Fig. 18.

Trials have been conducted on a number of 1-D-1 15,000-v single-phase electric locomotives on the Swedish State Railways, in which individual axle drives by flexible drive and quill have been tested, and which represents a departure from the previous practice of using coupled drivers with side-rod connections. High-voltage regulation of power supply during acceleration has been found in these tests to be superior to that obtainable with the hitherto conventional low-voltage transformer tapping method. The trials (conducted on three locomotives) have indicated the superiority of the individual axle-drive system, a conclusion reached some years past in American heavy electric-locomotive construction, and future locomotives of this type on the Swedish Railways will incorporate the findings of these tests. The locomotive is rated at 3600 hp, designed for a maximum speed of 85 mph, for hauling a 660-ton train on level track at 75 mph, and is the most powerful locomotive so far built for the Swedish electrified railroads.

The B + B 1500-v locomotive developed as a standard for both passenger and freight service on the London Northeastern Railroad in England is worthy of special note because it is among the largest electric B + B types ever built from the size, weight, and power viewpoints. The locomotive, Fig. 19, has a maximum 1-hr rating of 1868 hp, but the normal full-field 1-hr rating is 1740 hp, at a speed of 26 mph and tractive effort of 25,000 lb. The top speed is limited to 65 mph.

Another British-built locomotive, projected as a standard design, is the C-C 121-ton 650-v unit built by the Southern Railway in its own shops. Power collection is accomplished through third-rail shoes, although a pantograph is also provided for overhead collection on side track and yard track equipped with an overhead contact system. An unusual system of control is employed. A "buck-boost" motor generator, which adds to or subtracts from the line voltage, gives 26 running and accelerating steps, any of which may be used continuously. The locomotive is provided with train-heating equipment so that it can be used in pooled freight- and passenger-train service. The top speed is 75 mph.

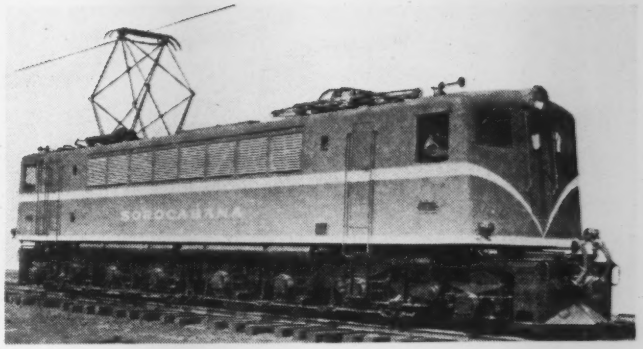


FIG. 18 1-C-C-1 ELECTRIC LOCOMOTIVE FOR SOROCABANA RAILWAY, BRAZIL
(Supplied by General Electric Company, and Westinghouse Electric & Manufacturing Company.)

DIESEL-ELECTRIC LOCOMOTIVES

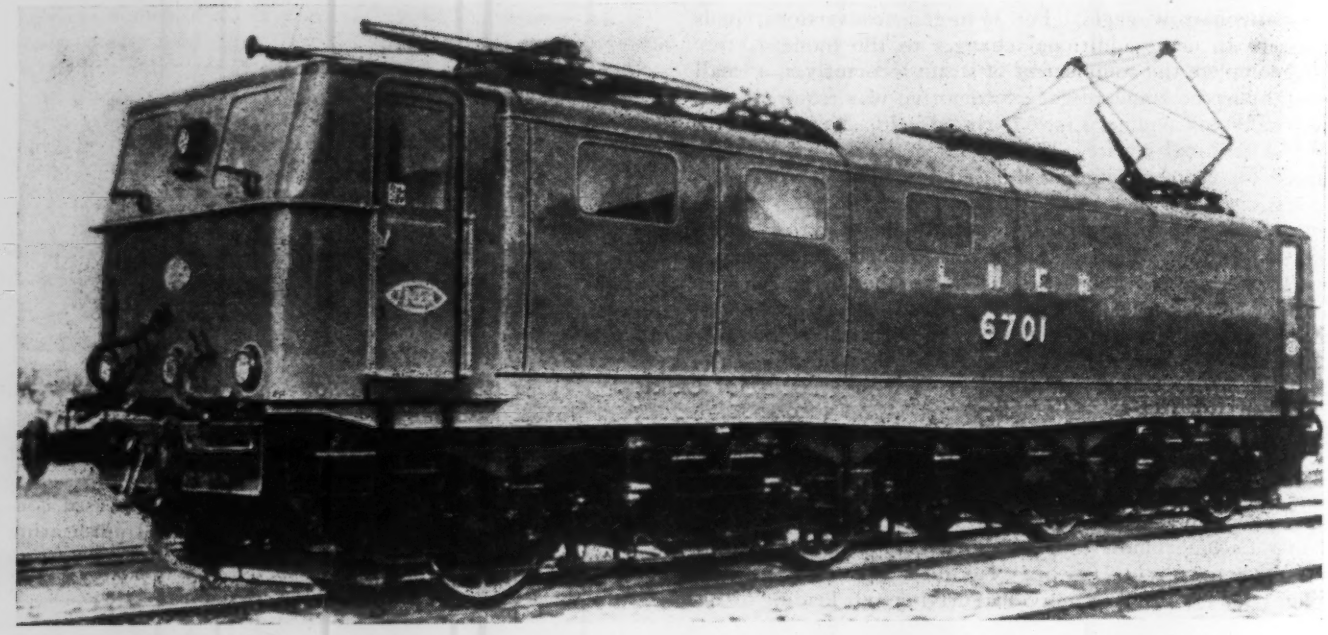
The current year witnessed the 10th anniversary of the introduction of the high-speed Diesel-powered streamlined train into American railroad service. The decade has witnessed the introduction of a large number of fixed-consist streamliners and also streamlined Diesel-electric units for the haulage of standard passenger-train rolling stock. Outstanding in this line is the large fleet of 4000-hp two-cab locomotives on the New Haven road. This road has in service and on order a total of thirty 4000-hp two-cab units which are used in both freight and passenger service. Geared for a top speed of 80 mph, the locomotives are used largely in passenger service during daylight hours and in freight service during the night hours when passenger-train service is curtailed in favor of freight-train operation. Thus the high availability of which the units are capable is utilized, with a consequent high average annual mileage and relatively low maintenance cost per mile for the component units of the fleet. Average monthly mileages approaching 15,000 have been realized, a remarkable achievement, considering the relatively short continuous runs available on the New Haven lines.

A fleet of fourteen 3600- and 4000-hp passenger locomotives, operating extended runs on the B.&O. between Washington and the cities of St. Louis, Chicago, and Detroit, has averaged approximately 18,000 miles per month per locomotive with maximum individual locomotive mileages of the order of 25,000 during the past several years.

The "standard" 2000-hp passenger units now in service incorporate two 1000-hp engines, a 2-cycle engine in the Electro-Motive standard, and a 4-cycle supercharged engine in the ALCo-GECo locomotive. Progress in current engine-development programs indicates that these standards will be superseded in the near future by designs involving but one engine per cab.

Many of the 5400-hp four-cab freight units, essentially duplicates of that described in the 1940-1941 survey, have been placed in service on various roads throughout the country during the past 2 years. In those applications where long, heavy gradients are encountered, locomotives have been equipped with rheostatic braking, the energy generated by traction motors, acting as generators, being dissipated in blown resistor assemblies mounted within the cabs just underneath the cab roofs.

The four-cab 6400-hp locomotive under construction in the shops of the Texas-Mexican Railway is unusual in that the four driving axles under each cab are carried in a rigid truck frame. Each of the two end cabs carries a single-axle guiding truck with a resultant wheel arrangement for the locomotive of



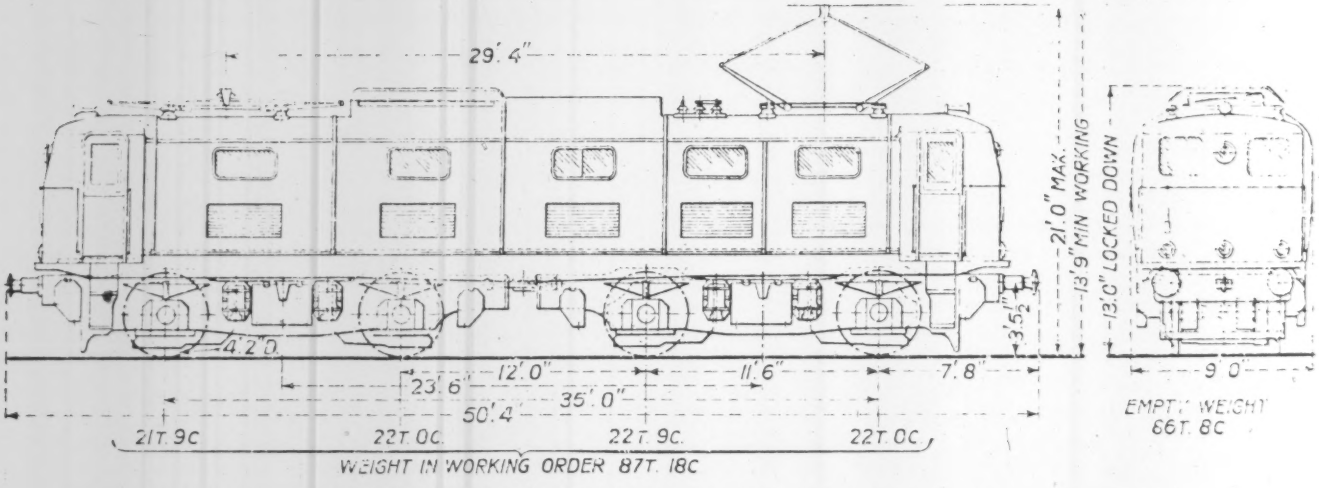


FIG. 19 B-B 1500-V LOCOMOTIVE FOR LONDON AND NORTHEASTERN

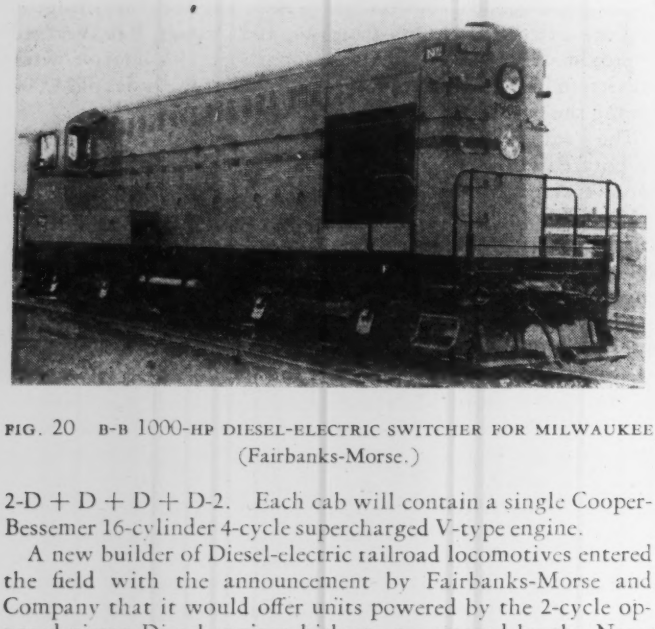


FIG. 20 B-B 1000-HP DIESEL-ELECTRIC SWITCHER FOR MILWAUKEE
(Fairbanks-Morse.)

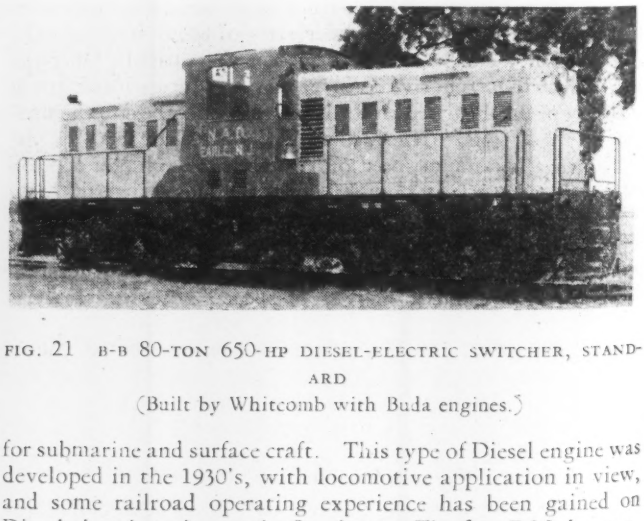


FIG. 21 B-B 80-TON 650-HP DIESEL-ELECTRIC SWITCHER, STANDARD
(Built by Whitcomb with Buda engines.)

2-D + D + D + D-2. Each cab will contain a single Cooper-Bessemer 16-cylinder 4-cycle supercharged V-type engine.

A new builder of Diesel-electric railroad locomotives entered the field with the announcement by Fairbanks-Morse and Company that it would offer units powered by the 2-cycle opposed-piston Diesel engines hitherto pre-empted by the Navy for submarine and surface craft. This type of Diesel engine was developed in the 1930's, with locomotive application in view, and some railroad operating experience has been gained on Diesel-electric trains on the Southern. The first F.M. locomotive made its appearance in 1944 on the Milwaukee and is a 1000-hp Diesel-electric switcher weighing 120 tons, with a 6-cylinder opposed-piston engine, operating at 800 rpm. The locomotive is shown in Fig. 20.

A three-cab 6000-hp demonstration locomotive, now under construction by the General Electric Company, is the first of a new line of road locomotives projected by Fairbanks-Morse & Company to utilize the opposed-piston engine. Each of the three cabs will house a 10-cylinder $8^1/_8$ in. × 10-in. two-cycle opposed-piston engine running at 850 rpm to deliver 2100 bhp, of which 2000 hp will be available as input to the generator for traction purposes. The locomotive will be built with a top speed of 75 mph, dictated by traction-motor gearing, but with provisions for substituting a lower gear ratio to permit operation in passenger-train service at a later date if required.

The Diesel-electric switching locomotive has definitely "arrived" as an integral part of the American railroad motive-power picture. A steam locomotive built today for purely switching purposes is a rarity indeed. Record quantities of Diesel-electric switchers from the 44-ton 380-hp size to the 115-ton 1000-hp class have been produced for the nation's armed forces and for the railroads to handle the traffic born of war conditions.

Many of the 1000-hp road switchers are in use in way-freight and transfer service and, in some cases, are used for extensive heavy road freight haulage where water conditions for steam locomotives are particularly difficult. Interesting among these are those built for the U. S. War Department for operation on the Trans-Iranian Railway. Axle-loading limitations prevented the use of the standard American 1000-hp road-switcher units with two two-axle swivel trucks. Accordingly, the standard was modified to incorporate two three-axle trucks with all axles motored.

Fig. 21 shows an 80-ton switching unit, built by Whitcomb, that is outstanding because of the relatively high engine horsepower provided in this weight of locomotive. Power is furnished by two Buda 325-hp 1200-rpm engines, acting through conventional electric-drive equipment to 36-in-diam wheels. Designed primarily for heavy-duty switching or light branch-line service, the top speed is 40 mph.

The narrow-gage (36 in. and meter) 47-ton locomotives built for service in Puerto Rico, Hawaii, and Chile are adaptations of a standardized design that has found wide application on American railroads for switching and light road service. Two Caterpillar engines with a total of 380 hp furnish the power for these units.

The future of the Diesel-electric locomotive in road service, both for passenger and freight service, is intimately bound up with the development of lighter (higher horsepower per pound) engines, the use of which means lower-cost locomotive mechanical structures and lower over-all initial locomotive prices. The critical situation with respect to fuel-oil supplies, the continued improvement in steam-locomotive design, and the appearance "just over the horizon" of a new type of motive power, i.e., the gas-turbine locomotive, necessitate improvements in design and reduction in price of the Diesel-electric road locomotive if its gradual adoption by the railroads as a standard motive-power unit is not to be arrested. That the developments in supercharging, largely the result of intensive research and experience in supercharging engines for military use, will be available for commercial purposes after the war, there is no doubt; and the years immediately following the conclusion of the current strife will doubtless witness large strides in Diesel-locomotive development.

DIESEL ELECTRIC LOCOMOTIVES FOR U. S. ARMY

Due to the many complex factors involved in war operation of railroads, it has been necessary to make use of the Diesel-electric type of motive power. The basic characteristics of this type power which are particularly adaptable for military operations are as follows:

1 Not dependent upon large quantities of water suitable for boilers.

2 Immediate availability on delivery.

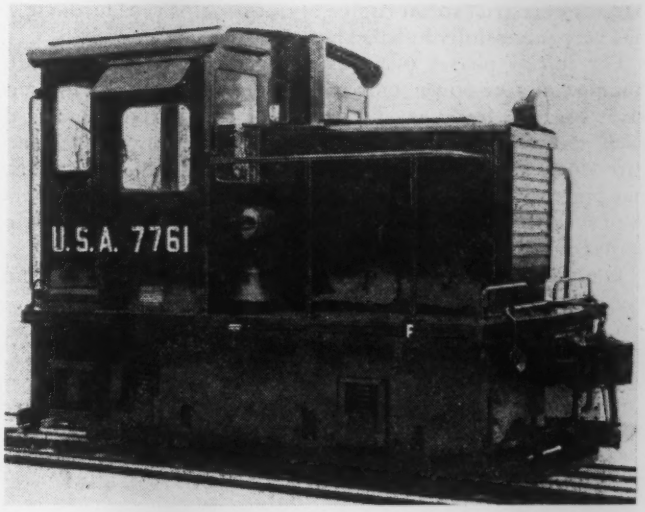


FIG. 22 DIESEL-ELECTRIC 150-HP 25-TON UNIT FOR U. S. ARMY (General Electric Company.)

3 Comparative ease of procurement and transportation of fuel.

4 One-man operation. (With multiple control several engines can be operated together by one man.)

5 Can be maintained without extensive repair facilities.

6 Performs equally well in road or switching service.

7 Absence of smoke and firebox glare at night very desirable where subject to enemy aircraft.

8 Is always ready for operation without preliminary steam-up period. This is especially important for emergency operations.

In the basic design of Diesel-electric locomotives, it is necessary to specify only the size and output of the power-plant unit, as this can usually be purchased from any one of several manufacturers. This feature of adaptability removes the dependency upon any one manufacturer, thereby assuring a more flexible source of supply. This advantage of having multiple supply sources applies also to most electrical equipment used on Diesel-electric locomotives.

For general use a 65-ton locomotive was developed to operate on all European standard-gage railroads. This unit, which has a top speed of 45 mph, is particularly suited for road operation in addition to the usual switching work. The 65-ton locomotive has been built in several modifications, without altering the basic design. Multiple control, as incorporated in these engines, further enhances their usefulness. A novel feature incorporated in locomotives of this type was the arrangement of radiators, and air intake. Radiators have been arranged without any surfaces exposed to gunfire. Air for cooling is taken through special air intakes. This has been accomplished without sacrifice to the cooling capacity of the unit. For operation in certain territories, this same type locomotive has been furnished with armor plate.

The 44-ton type locomotive, used extensively in the United States, has been redesigned for military use on railroads having very restricted axle-loading limits. This type locomotive is especially versatile in that it can be made for any track gage from meter to 66 in., by altering only the power trucks. These locomotives have also been provided with multiple control. With only minor changes to accommodate track-gage and coupler requirements, this type locomotive can be operated on practically any railroad in the world.

Where relative high axle loads on standard-gage track are permissible, a 127-ton locomotive has been adapted for Army use. This type locomotive, which has two six-wheel trucks and a single-engine power plant, is primarily intended for heavier road work. In certain districts where long tunnels or

bad water restrict steam-engine operation, this type locomotive has very successfully handled heavy road traffic.

For initial phases of invasion operations a small, easily handled motive-power unit was required. A 25-ton locomotive, Fig. 22, has been developed for this purpose and is of such size and weight that it can be unloaded without the elaborate dock facilities usually required. This type locomotive has practically gone ashore with the initial landing parties and is of such simple construction that it can be operated and maintained for extended periods with very little attention.

General characteristics of these four Diesel-electric locomotives are given in Table 5.

TABLE 5 CHARACTERISTICS OF DIESEL-ELECTRIC LOCOMOTIVES OF U. S. ARMY

	65-ton	44-ton	127-ton supercharged	25-ton
Diesel engine (cyl)	2–6 cyl	2–8 cyl	1–6 cyl	1–6 cyl
Traction motors	4	4	6	1
Maximum speed, mph	45	35	60	20
Horsepower	500	380	1000	150
Total weight, lb	130000	88000	252000	50000
Total wheel base, ft-in	29–0	22–2	39–0	6–0–3/4
Starting tractive force, lb.	43330	26400	75000	15000

CAR DEVELOPMENTS

Development of new passenger cars has largely centered in preparation for postwar manufacture, with the aim of decreasing the cost and increasing the comfort of passenger travel. The Pullman Company has announced a "duplex-roomette" car. The 24 rooms are arranged on each side of a center aisle, with the lower room at aisle level and the upper room reached by two steps. Each room has a comfortable seat, full-length bed, individual control of heat, light, and air conditioning, and other roomette features. The increased number of rooms will allow a rate about 10 per cent higher than for a lower berth.

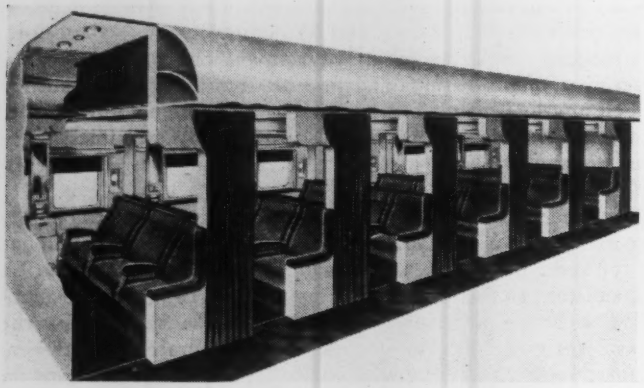


FIG. 23 COACH SLEEPER, ARRANGED FOR DAYTIME TRAVEL; PULLMAN

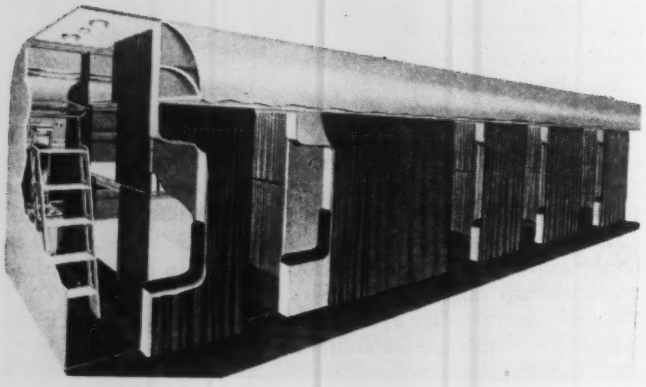


FIG. 24 COACH SLEEPER, MADE UP FOR NIGHT TRAVEL; PULLMAN

Plans for increased comfort of coach passengers are widespread, an interesting example being the Pullman coach-sleeper for 45 passengers. This consists of five 3-seat rooms and five 6-seat rooms, with a side aisle. Each seat is individually adjustable. At night the seat backs are lowered and berths are arranged in tiers of three. Each room has a washbasin and, in addition, there are two individual washrooms and a toilet at each end of the car. The car is designed for a rate approximately 30 per cent of that for a standard lower berth. Fig. 23 shows the coach sleeper arranged for daytime travel, and Fig. 24 shows the same car at night. The design of these cars, made several years ago, shows a combination of American and European practice adapted to the needs of inexpensive long-distance travel.

Freight cars have been largely standardized during the war period. Postwar developments indicate increased use of lightweight cars, high-speed trucks, and roller bearings. Since

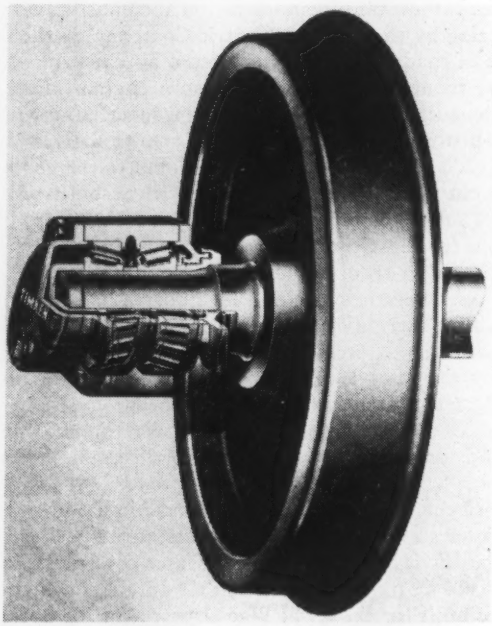


FIG. 25 OUTBOARD ROLLER BEARING FOR FREIGHT CARS; TIMKEN

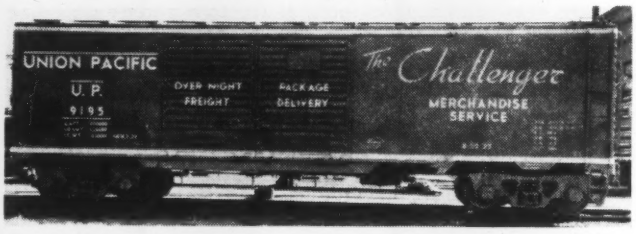


FIG. 26 ROLLER-BEARING FREIGHT CAR; OUTBOARD BEARINGS

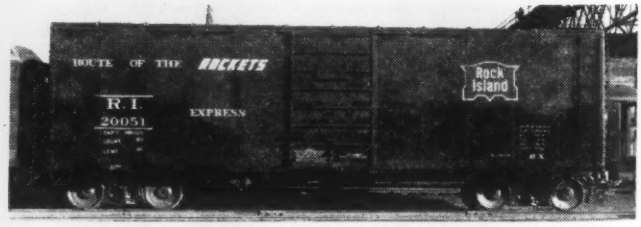


FIG. 27 ROLLER-BEARING FREIGHT CAR; INBOARD BEARINGS

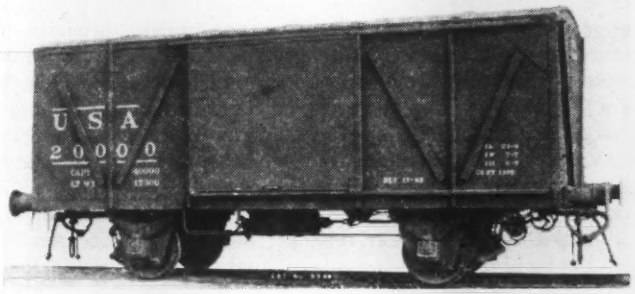


FIG. 28 20-TON FOUR-WHEEL BOX CAR FOR U. S. ARMY
(Pullman-Standard built.)

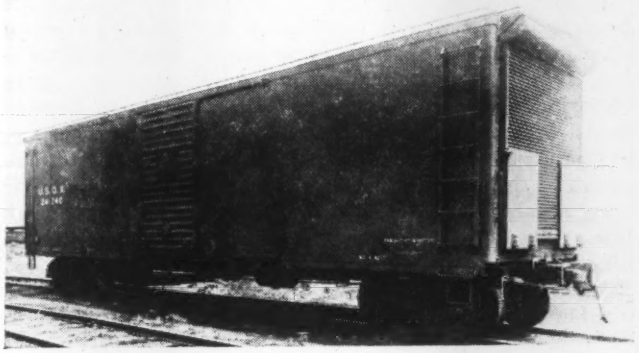


FIG. 29 AMMUNITION CAR FOR U. S. ARMY
(St. Louis car.)

roller bearings have come into general use for all types of locomotives and for passenger cars, their increased use on freight

FIG. 32 KITCHEN CAR FOR U. S. ARMY

cars is a subject of active interest, particularly as it makes possible an approach to "one speed high speed railroading" on certain railroads. A typical outboard journal box is illustrated in Fig. 25. Experience with roller bearing cars is now available covering a period of several years, an example being ten 50-ton-capacity cars placed in high-speed merchandise service in 1939, which, to June 1, 1944, had made a total of 2,296,782 miles in 56 months, or an average of 4101 miles per car per month. One of these cars is shown in Fig. 26, and a

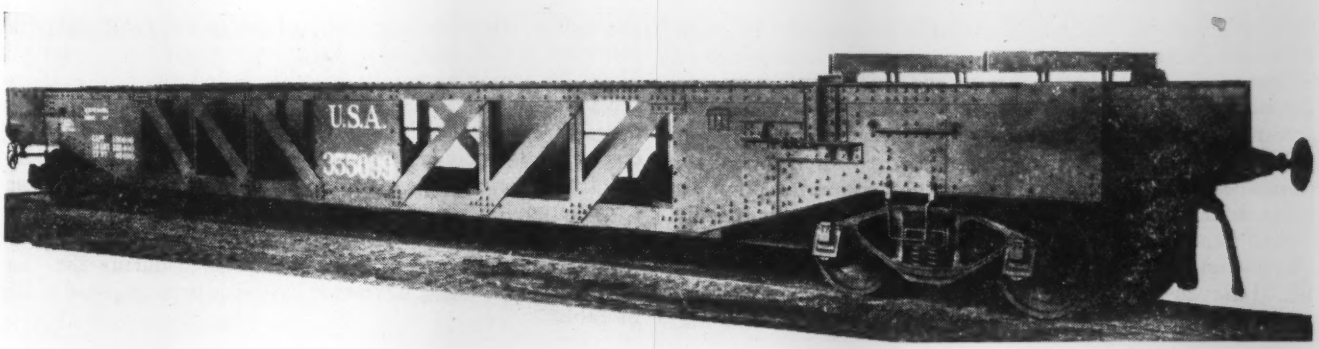


FIG. 30 50-TON LOCOMOTIVE TRANSPORT CAR FOR U. S. ARMY
(St. Louis car.)

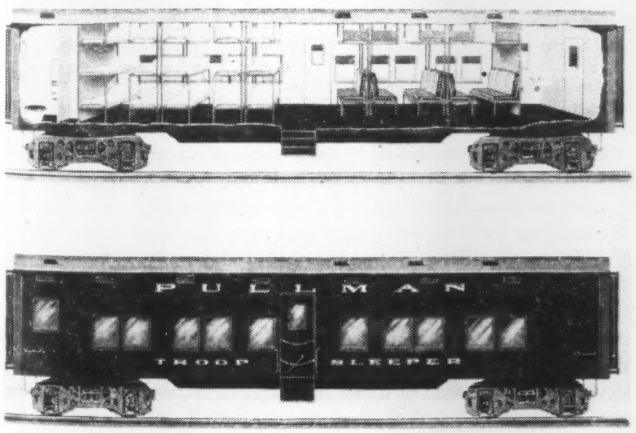


FIG. 31 TROOP SLEEPER FOR U. S. ARMY; PULLMAN

car with inboard roller bearings is illustrated in Fig. 27.

CARS FOR U. S. ARMY

The development of a program to supply cars for military operations has presented numerous problems not encountered in production of motive power. Whereas only three or four locomotive designs were required, there were approximately seven standard types of cars necessary. The standard-type freight cars to be supplied were as follows: Boxcars, Fig. 28; gondola cars (high side); gondola cars (low side); flat cars; refrigerator cars; caboose; tank cars.

TABLE 6 DETAILS OF TROOP SLEEPER AND KITCHEN CAR

	Troop sleeper	Kitchen car
Length inside, ft-in	50–6 3/4	50–6 1/2
Length over buffers, ft-in	54–2 1/2	54–2 1/8
Width inside, ft-in	9–1 1/8	9–1 1/2
Height inside, ft-in	9–5 3/16	9–3 15/16
Truck centers, ft-in	40–8 1/2	40–8 1/2
Number in service	1200	400

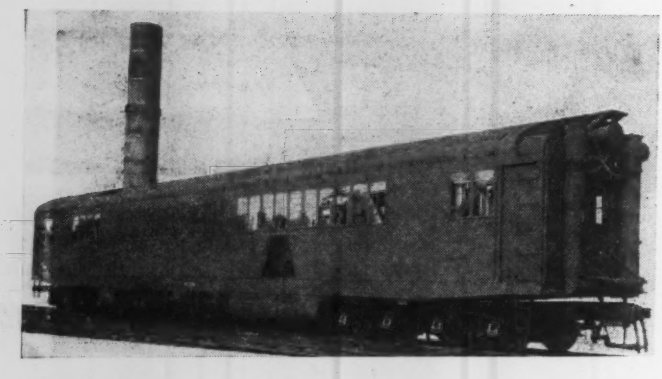


FIG. 33 BOILER CAR OF 10,000-KW MOBILE POWER PLANT FOR U. S. NAVY, BUREAU OF YARDS AND DOCKS

FIG. 34 TURBOGENERATOR CAR FOR 10,000-KW MOBILE POWER PLANT

In addition to these cars it was also necessary to provide in limited quantities certain special cars, such as the following: Ammunition cars, Fig. 29; locomotive cars, Fig. 30; well cars; kitchen cars; hospital cars.

As practically all of these different type cars were required in various gages and coupler arrangements, it was necessary to design such parts as underframes and end sills suitable to accommodate various couplers and buffers without excessive alterations during construction. In certain instances, it was realized that tolling equipment would be required for only a limited period. Wherever practical, therefore, equipment destined for more or less temporary service was built as cheaply as possible, consistent with safety and service requirements.

From time to time, it has been necessary to produce cars for special uses in the various theaters. Most important of these special units has been the hospital cars which have been built, both for overseas and domestic use. Special attention has been given to provide smooth riding as well as adequate medical service on these cars.

Illustrations are given of the troop sleeper, Fig. 31, and of the interior of an army kitchen car, Fig. 32. A few of the salient figures on these cars are given in Table 6.

The kitchen car is arranged for later conversion as a boxcar or express car for passenger-train service. The light weight is 77,500 lb.

In a particular overseas locality it was necessary to transport narrow-gage locomotives over standard-gage track before connecting with the narrow-gage railroad. To expedite movement to the narrow-gage line a special locomotive car, Fig. 30, was developed whereby locomotives could be assembled and quickly transported over the standard-gage line. This is cited as only one of the many transportation problems requiring special car equipment. As an example, a boxcar, converted for ammunition transport, is shown in Fig. 29.

MOBILE POWER PLANTS—RESEARCH

A considerable number of power plants, mounted in railroad cars, have been built during the last few years. Although primarily power-plant developments, not coming within the scope of this report, it may be of interest to note that designs range from those with locomotive-type boilers, intended to burn low-grade coal for long periods, to those with high-capacity high-pressure boilers burning fuel oil. One example is a 10,000-kw steam power plant contained in a 3-car unit, two of which were built for the Bureau of Yards and Docks, U. S. Navy. Fig. 33 shows the boiler car with its retractable smokestack in the extended position, and Fig. 34 shows the turbine-generator car. These cars, weighing approximately 200 and 250 tons, respectively, are built without centersills, and the turbine-generator car is unusual in having double four-wheel trucks at one end and double six-wheel trucks at the other to accommodate unequal weight distribution of power plant.

The activity of the railroad industry in research is becoming increasingly recognized. During the year Mr. Clyde Williams, director of Battelle Institute, was appointed by the A.A.R. to direct research activities. Railroad interest was also evident at a meeting of the Society for Experimental Stress Analysis in May, 1944, at which a paper on "Applications of Electric Measuring Equipment in Railroad Research" was delivered by Messrs. Magee and Ferguson of the A.A.R. Other papers on the measurement of residual stresses and on the effect of residual stresses on the strength of metals were of interest and value to many members of the railroad industry. This activity is closely related to the research on strength of axles and crankpins being conducted by the A.A.R.

The second progress report on locomotive crankpin tests was issued by the A.A.R. in 1944 and covers research of the greatest value on 49 full-size solid crankpins $9^1/_2$ in. diam. This work is not only applicable to these pins, but the results indicate what can be done to increase the fatigue strength of other parts and constitutes an outstanding addition to the literature on fatigue of metals.

For a straight cylinderical pin, based on 300,000 miles on 72-in. wheels, a bending stress of 11,000 psi was found to be allowable. By providing a slight taper on the outer end of the crankpin wheel seat, this value was raised to 15,000 psi. Flame-hardening a straight cylindrical pin brought the allowable stress to 16,000–18,000 psi, and surface-rolling raised it to over 22,000 psi. Data on initiation and propagation of fatigue cracks are also included in this 156-page fully documented report.

Interest in new types of motive power is shown by the continued study of the possibilities of the gas-turbine locomotive. Reference has been made in a previous report to a proposed design, and new designs have been studied during the year. Two proposals which have been described are compared briefly in Table 7.

TABLE 7 PROPOSED GAS-TURBINE LOCOMOTIVES

Proposed by	Allis-Chalmers Co.	General Electric Co.
Horsepower rating	4800	4500
No. of power plants	2	1
Total weight, lb	450000	360000
No. of axles	6	6
Weight per axle, lb	75000	60000
Drive	Electric	Electric
Length, ft-in	90-0	75-4
Train-heating	2 separate boilers	1 waste heat boiler

Both designs can be lightened, according to their authors, by the use of lightweight materials. Both designs are intended to burn low-grade fuel oil. The widespread interest in this type of motive power makes it probable that further development will be intensified when war conditions permit.

ACKNOWLEDGMENT

The Committee wishes to express its gratitude to the many who have furnished information, and particularly to the Army Service Forces, Office of Chief of Transportation, to the *Railway Age*, *Railway Mechanical Engineer*, and *Railway Gazette*, which have been freely drawn upon; and to Mr. T. F. Perkinson, who has greatly assisted in the compilation of the report.

SPECIAL CORROSION PROBLEMS *in* AIRCRAFT

By W. E. DONALDSON

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THE use of light metals in aircraft manufacturing has focused the attention of technical men on the increasing importance of corrosion problems as applied to these metals. Aluminum and magnesium alloys are both anodic to other metals as can be seen by looking at the galvanic series of metals. Being anodic, or less noble in character, they are more susceptible to corrosion in dissimilar-metal contacts than iron, steel, copper, or other more noble metals.

Generally, we find that we may classify corrosion into three different and distinct types. In many practical manifestations of corrosion we find one or all three of these types producing a corrosive action, but it is usually possible to differentiate between them and their respective corrosive actions.

CORROSION CAUSED BY DIRECT CHEMICAL ACTION

The first and most general type of corrosion encountered consists of a direct chemical action in which an acid acts upon a metal, forming a salt and releasing hydrogen. Under this same heading can also be classified oxidation of metals such as rusting of iron. Elements such as oxygen, halogens, and the metallic salts formed from acids all contribute, of course, to corrosion by forming salts of the metals. Industrial areas in which the air is contaminated with the various chemicals produce general chemical corrosion. Some writers have contended that acid or oxidation types of corrosion are attributable to a form of electrolytic action. In some cases this may be true, although it is questionable whether all cases can be traced to such a cause.

Aluminum presents some rather unusual problems from a corrosion standpoint. This may be illustrated by citing some examples of aluminum corrosion encountered in aircraft manufacturing. It is a somewhat common occurrence for battery acid to boil out of the battery when the battery has been subjected to an overcharge. This acid may be carried back, in spite of overflow jars, through certain structures in the airplane, depending on the location of the battery on the ship, and causes corrosion to take place. The natural reaction of an aircraft mechanic is to neutralize the acid with ammonia or someother alkali. As aluminum is affected much more by an alkali than by an acid, this remedy, if improperly controlled, may cause more corrosion than would have originally been caused by the acid itself.

The correct action in this case is not to use alkali as a neutralizer, but simply to dilute the battery acid by washing it off with a copious quantity of water and then painting the areas affected with 10 per cent chromic-acid solution, preferably hot, which does not neutralize the remaining sulphuric acid but does act as an inhibitor to its action on aluminum. Any further corrosion is prevented by the inhibiting action of the chromic acid.

In storing aluminum sheets, paper is used to prevent scratching of the aluminum. If, however, the paper becomes wet from rain, dew, or condensation, sodium sulphite will leach out of the paper and cause corrosion of the aluminum. This has been a source of trouble, both in storage and shipping, and the only solution is to keep the material dry, or immediately to unpack and dry any sheets which become wet.

Many types of forming oils have a corrosive effect on aluminum, and in many cases this has been the cause of considerable rework in the shop. The use of trichloroethylene as a degreasing fluid for aluminum parts has caused many perplexing problems in using this type of degreasing. Considerable work has been done by the industry in preventing the breakdown of trichloroethylene due to the addition of water to the solution. Small aluminum chips or grindings when combined with chlorine as aluminum chloride act as a catalyst in this breakdown of trichloroethylene into hydrochloric acid. This breakdown is progressive in that the formed hydrochloric acid accelerates the action. The hydrochloric acid concentrates in the dirt, conglomerates in the bottom of the tank, and seriously attacks parts dipped in the degreaser.

CORROSION CAUSED BY DISSIMILAR-METAL CONTACT

The second type of corrosion encountered in aircraft manufacture, and probably the most important one, is caused by dissimilar-metal contact in an electrolyte. An example of this type of corrosion is found when steel and magnesium are riveted together and subjected to salt water or any mild electrolyte. Two dissimilar metals in an electrolyte generate an electrical potential which causes the anodic material, which in this case is magnesium, to corrode or dissolve in the electrolyte. The potential created by dissimilar-metal combinations such as magnesium-steel, aluminum-steel, aluminum-copper, aluminum-brass, for example, may create a potential varying from one hundredth of a volt to as high as one volt, depending upon the conditions under which such an electrical cell is operating. In designing airplanes, it is therefore quite essential to avoid such a combination of metals that will set up this battery action. The higher the difference in potential between the metals, the more rapid the corrosion involved will be. Other factors affect these reactions, however, such as the ratio of anode area to cathode area. If the area of the noble metal is small in comparison to the less noble metal, very little action will take place. But if the reverse is true, then rapid corrosion of the anodic part is likely to occur. These factors must all be considered in designing aircraft parts.

A good example of electrolytic corrosion, which was definitely accelerated by an impressed electric current, occurred in the use of multipin electrical connector plugs. These plugs consist of an aluminum case with a plastic insert plate separating the contact pins or sockets. A cadmium-plated snap ring holds the plastic insert in the aluminum shell. The contact pins are silver-plated brass (with solder-filled solder cups) and therefore have different anodic characteristics from the aluminum and cadmium-plated steel ring. Under normal dry conditions, the plastic acts as an insulator between the pin contacts and the shell. When the plug becomes wet because of moisture condensation or leakage in rainy weather, there is sufficient electrolyte to bridge the gap between the pins and the aluminum shell and between the cadmium-plated ring and the shell. This causes an electrochemical action to take place and results in the rapid corrosion of all metal parts. This condition as found in the field was duplicated in the laboratory. It was demonstrated that within one hour's time the plug had become

useless because of the corrosive products formed. The solution to this problem consisted of keeping all moisture away from the plug either by coating the plug itself with wax or some other insulating material, or by installing the plugs in a waterproof box. A plug of this type could be designed to give more satisfactory service than the type now in use by providing drainage, although it is often difficult to make a universal change in standard parts of this sort.

CONCENTRATED CORROSION CELLS

The third type of corrosion most commonly encountered is known as the concentration or solution cell type of corrosion. This type of corrosion cell may be developed by a number of different combinations of electrolytes and metals. Such cells may be classified into four general types:

1 The same metal with different electrolytes.
2 Different metals with the same electrolyte.
3 Two metals with different electrolytes.
4 The metal and two concentrations of the same electrolyte.

An example of how such a cell may be formed may be illustrated by a lap joint into which an electrolyte, such as rain water or sea water, may leak along the inside of the lap and create a pocket of the electrolyte between the two sheets of metal. Water, leaking through into the lap, creates one concentration of the solution in the area just inside the faying surfaces, while the back part of the pocket formed by the two sheets of metal may contain solution of a higher salt concentration, thus creating a concentration cell having the same metal in an electrolyte of two different concentrations. This creates a potential causing corrosion of the metal. It is readily seen that innumerable cases occur in which such a cell is possible, and in the general design of aircraft a strong effort is made to see that all areas are thoroughly drained and that under no circumstances is a pocket formed in which an electrolyte could accumulate.

MEANS OF PREVENTING CORROSION

The aircraft process engineer has several means at his command to combat corrosion. If he can prevent the completion of an electrical circuit between dissmilar metals or in a concentration cell, then he has accomplished his purpose and prevented corrosion from taking place. Several means of preventing current flow are available. On aluminum, an oxide film is formed and the process is termed anodizing because the aluminum is made the anode in a charged chromic-acid bath. The oxide film produced is passive and nonconductive, and therefore a considerable protection to the aluminum when it is in contact with other more noble metals. This film is sufficiently porous to act as a paint base so that when the aluminum is anodized and painted, a tough inorganic and organic film is produced which satisfactorily prevents current flow. A similar type of treatment is given magnesium with the same purpose in mind. Most of the aluminum sheet used today in aircraft is coated on each side at the mill with a thin coat of pure aluminum called a "clad" which serves two purposes in protecting the aluminum alloy beneath. There is, of course, a mechanical protection afforded, but this is less effective than the actual electrochemical action afforded by clad coat. The pure aluminum covering the alloy is anodic to the alloy, has a higher potential, and thus, in the presence of a concentration cell or electrolytic action of any kind, tends to dissolve before the alloy itself, hence the strength of the alloy is only slightly reduced and only the soft aluminum covering is corroded. Clad sheet is now almost universally used in aircraft. To date, a clad-coated magnesium sheet that has proved successful has not been developed. Since magnesium is even more anodic to other metals than aluminum, we find considerably more difficulty in protecting magnesium than we do in protecting aluminum.

OTHER CORROSION PROBLEMS

A number of metallurgical problems enter into the corrosion of metals which I can discuss only briefly. Intergranular corrosion takes place in practically all heat-treatable alloys in which, under improper heat-treatment or full annealing temperatures, a difference in potential exists between the grain boundaries and the grains of the metal itself. This is forcibly brought to our attention when an aluminum alloy such as 24S is fully annealed. The copper in the alloy, because of $CuAl_3$ precipitation around the grain boundaries, causes a measurable difference in potential in these areas. Other factors affecting corrosion of metals may include stress corrosion due to internal stresses within the metal itself, which, in turn, create a difference in potential between two areas within the metal. Some metals are subject to stress corrosion while others are practically immune, depending on the composition of the metal, size of the grains, and stress applied.

The Layout of Technical Papers

REFERRING to illustrations Mr. Williams says in his paper[1] that they "enable the author to avoid tedious descriptions and are usually a better medium than the written word for conveying exact ideas of shape and size." This clearly applies to any technical paper, no matter where it may be published. The remarks on diagrams are useful. These should not present "several topics of equal value all clamoring for attention at once." As a rule, "three topics are all that can be clearly shown on the same diagram," and "all diagrams should have the minimum number of lines." Much current practice departs far from these admirable suggestions; diagrams are so complicated and so small that far from "economizing the readers' time and energy," they are the most difficult part of the paper to comprehend. The trouble in many cases appears to be that the author constructs his diagrams on a large scale and gives no thought to what they will look like when reduced to a few inches in width. This evil has been accentuated by present conditions when space has become more valuable, which is an additional reason why authors should consider their diagrams from the point of view of the form in which they will ultimately be presented to the reader.

To those in need of the instruction Mr. William's remarks on "lengths of sentences" may be of service . . . . . It is stated that "an occasional short sentence can be employed to retard the pace and so lend emphasis . . . . but a sequence of short sentences besides being monotonous may also be ambiguous" for the reason that it may be difficult to determine whether a second statement is a consequence of a first or whether the two are independent. If Mr. William's advice restrains some unpracticed writers from attempting to cultivate this undesirable style it will do a service, but the beginner may have difficulty in determining at what point he is justified in introducing a short sentence to "retard the pace." The instruction on long sentences is more specific; they should not exceed 75 words in length. Again, this may be useful to the writer who writes infrequently, but no practiced writer would find it necessary.

There are some *obiter dicta* on titles. These should be "exact, brief, and euphonious." The issue of the *Journal* containing Mr. Williams' paper contains two others. One is entitled "A Brief Survey of the History and Nature of Millwrighting; With a Call for Greater Pride of Craft in the Postwar World" and the other "Experiments on the Candle-Power and Brightness of the Positive Crater of the Electric Arc, Using Solid Carbons and Graphite Electrodes." These may both be exact and euphonious, but they can hardly be described as brief. It is doubtful, however, whether the brevity called for is always desirable.—*Engineering*, June 30, 1944, p. 512.

[1] "The presentation of Technical Literature," by G. E. Williams, *Journal of Electrical Engineers*, May, 1944.

Setting TOLERANCES *Scientifically*

By WILLIAM B. RICE

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IN many machine shops and metalworking plants there have grown up over a period of years certain practices with regard to tolerances which can well bear re-examination. The blueprints may call for one tolerance; inspection gages may allow another usually wider tolerance, and the foreman may be even more liberal. Each of the three parties views the operation from a different standpoint. The engineer sees the problem as one of design; the inspector tries to maintain an acceptable quality; the foreman is under pressure to produce in quantity. Much of the spoilage and reworking which cost American industry so much in time, money, and manpower arise from a failure to co-ordinate the viewpoints and practices of the designing, inspection, and production departments.

One reason why engineers, foremen, and inspectors have different ideas about what tolerances should be permitted is that there are several ways in which inspection can be done. Take as an illustration a $^1/_2$-in. turning on a four-spindle automatic screw machine. If four successive pieces are taken off the same spindle, the diameters of the four turnings will probably vary by less than 0.001 in. If, however, one turning is taken off each spindle, the measurements may vary by as much as 0.002 in. Again, suppose that a run of 50,000 turnings has been completed; if a large sample (say 1000) is taken at random from the entire lot, the difference between the largest and smallest diameters measured may be 0.006 or 0.007 in.

Another reason for disagreement is that the dimensions of the work which can actually be produced depend upon many factors. A new machine will hold more closely than an old one; skilled workers can do more accurate work than green hands can; experienced foremen are able to get better results than untried men in supervisory jobs. Material, too, has a strong bearing on quality, as have the kind and quantity of tooling, personnel relationships, morale, pay, and a thousand other factors which come and go, fluctuating throughout the process in usually unpredictable fashion.

In general, product or design engineers often seem to do their planning and drafting with reference to somewhat ideal conditions, assuming good machines, well-trained workers, and skilled supervision, or else they use reference tables which may tacitly assume such factors. Therefore, tolerances on blueprints tend to be conservative and are sometimes actually impossible of accomplishment with any degree of economy in the manufacturing process. Nearly ideal conditions may be attained during some small part of the process, but almost never for any extended period of time.

Production men, on the other hand, knowing from experience that a careless operator, a soft spot in the steel, a slight off-adjustment of the tools, a loose collet, or any one of a multitude of other troubles will cause an automatic, for instance, to do out-of-tolerance work, are inclined to ask for more liberal tolerances; if these are not forthcoming they just "do the best they can." Unfortunately, they do not always stop to figure how they can make that best better. Being human, and under pressure to turn out large volume, they are prone to accept what they have as the best they can get.

The process inspector, caught in the cross fire of these opposing interests, usually has to compromise. The workmen on the floor, with whom the inspector is in daily contact, argue that too strict adherence to blueprint standards will slow down or even stop production, and that another thousandth "won't make any difference anyway." The engineering department, more remote but exerting its influence through the blueprint which the inspector sees and uses constantly, calls for certain dimensions to which all pieces must adhere. Who can blame the inspector for letting an occasional out-of-tolerance piece go by under such conditions?

PRODUCING USABLE ARTICLES ECONOMICALLY

Two dangers arise, however, under such circumstances: (1) Neither the inspector nor the foreman knows every step in the manufacturing process, hence their judgment as to what can and what cannot be allowed to pass is usually poor. (2) Laxity is encouraged which may destroy the validity and nullify the value of inspection. The idea of concrete objective standards which result in *usable articles economically produced* should be basic to the inspection function. Violating this idea undermines the fundamental purpose of inspection.

Usable articles are those which meet consumer requirements. They can be described by "consumer specifications." In designing a certain wrench, it was necessary to determine the minimum required strength. Several hundred commercial bolts and nuts of the appropriate size were tested. It was found that a torque of 1500 in-lb broke every one of the bolts. This was a consumer specification and defined the minimum strength required of the wrench.

Articles economically produced must fit the manufacturing conditions in the factory. These conditions can be described by "natural specifications." In the case of the newly designed wrench, a trial lot of 500 was run through the plant. Upon being tested, they broke at 1200 to 2000 in-lb; this was the natural tolerance of the process. It was not satisfactory because the consumer minimum limit was 1500 in-lb. There followed a methods study which resulted in a different though more costly heat-treating process, resulting in a minimum breaking point of 2100 in-lb in another trial batch. On the basis of this test, the design specification was set at 2000 in-lb, providing a $33^1/_3$ per cent margin over and above the consumer requirement. An analysis of the frequency curves involved gave a probability 1 in 1,000,000 that if these "consumer" and "natural" specifications were met, a wrench would break before the bolt on which it was used would give way.

When a comparison of competitors' prices and quality revealed that the selling price of the new wrench could be set at a profitable figure in spite of the more expensive heat-treating process, management decided to go ahead with production of the new wrench.

SET TOLERANCES THAT CAN BE MET

For new products or old ones the scientific approach to the question, "What engineering specifications shall be set up?" is to make a double-barreled investigation: (1) Find out what specifications are required in actual use; (2) determine how the required tolerances can be met most economically in factory production. Such investigations are not often made before design tolerances are set up. If they were, the confusion, waste, and delay which result from the designer, the inspector, and the foreman each having his own standard could be largely eliminated. In general, the more liberal the tolerance the lower the cost of production. Often costs can be cut in this way without sacrificing quality, provided that the final decision is based upon careful and conservative study of what is required in actual use.

The suggestion that tolerances should be liberalized may

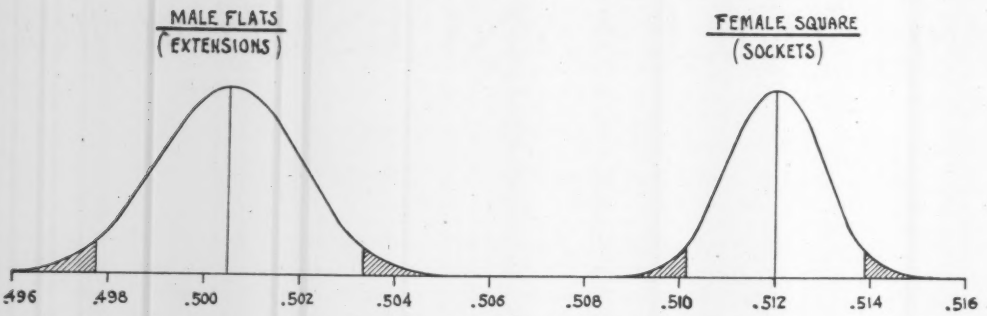

FIG. 1 CHART SHOWING NATURAL TOLERANCES OF EXTENSIONS AND SOCKETS AS DETERMINED BY STATISTICAL ANALYSIS

seem to be a dangerous one. Quite the contrary, however, is true. There is hardly a plant in the United States, except perhaps those producing highly critical fine-tolerance work, where blueprint requirements are met 100 per cent in the finished product. Yet our products—American products—are known to be the best in the world. Realistic acceptance of this fact and a scientific analysis of it may result in a widening of blueprint tolerances, but will also bring about a tightening of natural or operating tolerances. Better outgoing quality will be maintained at lower cost because design engineers, inspectors, and production men will see eye to eye, working together toward the same practical goal.

To solve this problem in any particular instance requires a combination of statistical technique, engineering knowledge, and production understanding. It should be pointed out that the principles involved in the following example are applicable to any specifications or tolerances which are capable of being measured, not only in metalworking but also in chemicals, foods, mining, agriculture, and a host of other industries. The principles are universally valid although the path of attack will have to vary with each specific problem. A case history, taken from actual experience but somewhat simplified for purposes of presentation, will illustrate how such a problem was tackled.

Every mechanic uses sockets and attachments. The socket has a square hole into which the end of the attachment fits. There is a ball and spring assembled on the male square (attachment) which catches in a ball check hole in the female square (socket) so that the two tools become a single driving unit. Important dimensions are: On sockets, the inside dimension of the female square; on attachments, the width across the flats and the height of the ball.

Problem: What tolerances should be set for the dimensions of the male and female squares?

In actually working out this problem, there were several variables involved, but for the sake of clarity in presentation only the distance across male and female squares will be considered. The type of attachment studied was an extension, a straight metal bar with a male square on one end.

The first step was to make several hundred random assemblies of finished sockets and extensions to determine what maximum and minimum clearances between male and female squares were necessary for practical use in a mechanic's work. This was done by a field survey. When the effect of ball height and other variables were removed, it was found on the $^1/_2$-in. drive series that a minimum of 0.004 in. and a maximum of 0.015 in. clearance between male and female squares was required.

Next came a study of the manufacturing processes. Control charts, applying the Shewhart quality-control technique,[1] were used to eliminate uncontrolled variations. Long and practical experience by many of the leading manufacturers in the United States and Great Britain has proved that when this has been done and the process is in a state of statistical control, no further improvement can be made without a basic change in the process itself. It is logical therefore to use "control-chart limits" as a basis for determining natural tolerances. In the socket and extension problem, when statistical control had been reached and the natural tolerances had been determined, the frequency distributions shown in the chart, Fig. 1, were obtained.

These two curves proved upon statistical testing to be approximately normal, that is, the controlled processes produced parts in a way which obeyed the laws of chance. Normal curves or approximately normal curves occur in biological, educational, and agricultural research, in vital statistics, insurance, and many other fields. The normal curve is used in classrooms to describe variations in the mental skill of people; it describes equally well the manual skills of factory workers and usually the cognate "skills" of machines.

Knowing that the curves were normal made it possible to draw sound conclusions as to the probability of any individual part falling outside any specified limits. One third of the males produced, for instance, would be smaller than 0.499 in. and larger than 0.502 in.; similarly, one third of the females would fall outside 0.511 in. and 0.513 in. These and other probabilities, derived from the normal curve, are given in Table 1.

TABLE 1 PROBABILITIES DERIVED FROM NORMAL CURVE

Probability P_t of a piece falling outside $X \pm t\sigma$		—These limits represent— For male dimension	For female dimension
Limit	P_t	$(X_M = 0.5005)$ $(\sigma_M = 0.0015)$	$(\overline{X}_F = 0.5120)$ $(\sigma_F = 0.0010)$
$\overline{X} \pm 1\sigma$	0.33 approx.	0.4990–0.5020	0.5110–0.5130
$\overline{X} \pm 2\sigma$	0.05 approx.	0.4975–0.5035	0.5100–0.5140
$\overline{X} \pm 3\sigma$	0.003 approx.	0.4960–0.5050	0.5090–0.5150

NOTE: $\overline{X}$ = Arithmetic mean of process.

σ = Standard deviation, the best measure of dispersion; formulas for its calculation will be found in any standard text on general statistics. For calculating tolerances, however, only controlled frequency distributions should be used. If desired, σ can be derived from control-chart limits, the formula being:

$A_2\overline{R}\sqrt{n} = 3\sigma$, where n is the number of measurements in each sample or subgroup, $\overline{R}$ is the average range and A_2 is a conversion factor depending on sample size. (See A.S.A. pamphlet Z1.3–1942 referred to in footnote 1.)

Since the normal curve is not a closed curve, it is impossible to set any limits within which all pieces will fall, or outside of which none will fall. No matter how far away from the mean the curve is extended, there always remains a probability, however small, of finding a piece larger or smaller than any specified limits. Here it is that statistics impinge upon design engineering. If manufacturing processes generally follow normal or nearly normal patterns, the designer cannot set his tolerances and say, "Every piece made must be within these limits." On the contrary he can be sure that some pieces, however few,

[1] See American Standards Association pamphlet Z1.3–1942, "Control Chart Method of Controlling Quality During Production," and bibliography therein.

will exceed his tolerances, and that his limits will never be absolute, but merely probability limits. Unless he is prepared to demand 100 per cent inspection at every stage of the process (an obvious impossibility), his specifications should say, "At least .... per cent must fall within these limits."

If S indicates the specification and A, B represent specific dimensions, the correct mathematical statement is

$$\text{Not } S = A, B,$$
$$\text{But } S = P_{A,B}$$

where $P_{A,B}$ is a maximum probability of parts being larger or smaller than A or B.

Applied to the socket and extension problem cited, these principles require first an answer to the question, "What risk does the manufacturer want to take that, somewhere, sometime, a mechanic will pick up a socket and an extension with less than 0.004 in. or more than 0.015 in. clearance between them?"

Telephone companies have a similar problem. Given two exchanges, Y and Z, how many trunk lines are needed in each exchange so that there will be a probability no larger than P that a subscriber in one exchange will be unable to find an open line in the other exchange at the peak-load hour? In many cases telephone companies have accepted one chance in a thousand as economical, that is, $P = 0.001$. Then John Doe, as the subscriber, would be able to get his call through 999 times out of 1000 and would have to wait only once in a thousand calls. A P of 0.0001 or 1 in 10,000 for instance, requires many more trunk lines and makes the service too expensive; a P of 0.01 or 1 in 100, although it gives cheaper service, may create subscriber dissatisfaction. In other words, $P = 0.001$ has been found to strike an economic balance between the two extremes.

QUALITY AN ECONOMIC PROBLEM

So it is with any manufacturing process. Quality can be so high as to make production unprofitable, or it can be so low as to create consumer prejudice. The manufacturer, considering his prices and costs, must hit upon a happy medium. In the socket-and-extension problem, the experience of telephone companies was followed, and the economical probability of a mechanic finding an out-of-tolerance clearance between male and female dimensions was taken at $P_{M,F} = 0.001$. Since this $P_{M,F}$ is the product of two independent probabilities, one of finding an extension defective (P_M), the other of finding a socket defective (P_F)

let

$$P_{M,F} = 0.001 = P_M \cdot P_F$$

and let

$$P_M = P_F$$

therefore

$$P_M \text{ or } P_F = \sqrt{0.001} = 0.0316$$

Applied to the most critical probability, that of picking an extension too large and a socket too small, this result means that a 3 per cent chance can be allowed of finding an extension larger than the specified tolerance and a 3 per cent chance of finding a socket smaller than the specified tolerance, with still only 1 chance in 1000 of having a clearance too small. Referring to the frequency curves shown in the chart, Fig. 1, and noting that $\sigma_M = 0.0015$ in., and $\sigma_F = 0.0010$ in., all that needs to be done is to determine what areas in the adjacent tails of the two curves contain 3 per cent of the total area of each curve.

To do this, look up $(0.5000 - 0.0316 = 0.4684)$ in a table of areas under the normal curve, finding 1.86σ as the answer. Therefore, the 3 per cent "bad" area begins at $\overline{X}_M + 1.86\,\sigma_M$ for extensions and at $\overline{X}_F - 1.86\,\sigma_F$ for sockets. Between these limits a distance of 0.004 in. must be allowed for the minimum clearance.

In the same way the 3 per cent limits for the opposite tails of the curves can be determined in order to set up tolerances for the maximum clearance. In the process by which these sockets and extensions are manufactured, the average absolute dimensions are determined by tooling. Either of the curves can therefore be shifted to the right or left as desired. A total space of 3.72σ (1.86σ on each side of the mean) is needed for each curve, plus 0.004 in. between them:

$3.72\sigma_M = 3.72 \times 0.0015 = 0.0056$ in. for extensions
$3.72\sigma_F = 3.72 \times 0.0010 = 0.0037$ in. for sockets
plus 0.0040 in. for minimum clearance
0.0133 in. maximum clearance

This easily meets the 0.015 in. maximum required by the consumer research previously made.

The entire 0.0133 in. can now be shifted along the base line of the curves and set at any desired point. Suppose that 0.513 in. is the largest desirable female square dimension. Then, starting at 0.513 in. and working to the left as in Fig. 1, using nearest thousandths, the tolerances would be as follows:

For sockets: 0.513 in. to 0.509 in. or preferably 0.511 in. $\pm$ 0.002 in.
For extensions: 0.505 in. to 0.499 in., or preferably 0.502 in. $\pm$ 0.003 in.[a]

These tolerances require, on the one hand, a shift of the male frequency curve (see chart Fig. 1) from its present position ($\overline{X} = 0.5005$) to ($X = 0.5020$), and a shift of the female curve from ($\overline{X} = 0.5120$) to ($\overline{X} = 0.5110$). Since these averages can be controlled by tooling design, the shifts are not difficult to make; and they result in a better-fitting more acceptable product.

On the other hand, the new tolerances require no change in the natural range or dispersion found in the manufacturing process; this is economical because the process "control limits" used in calculating the tolerances are, in this case, difficult and expensive to change. They are inherent characteristics of the process itself and can be altered only by a major change in production methods.

Thus by a statistical study of (*a*) consumer requirements and (*b*) the process itself, it is possible to establish specifications which meet the requirements of the sales department in so far as customer demands are concerned; and in so doing to find out how the required tolerances can be met most economically in the factory. In this way, top management can be sure that the factory is able to produce at a profit an article acceptable to the consumer.

THE contributions of science to discipline can hardly be overestimated. It afforded a training in exact observation of inert and living matter and of the changes in them; it demanded the highest accuracy in measuring; it called for far-reaching efforts of the imagination to frame the problems and to devise the techniques; it opened a world full of new possibilities to men whose ingenuity was of a kind not before given much opportunity, and it called forth a great body of talent that the Classics had not touched, men with a gift with their hands and eyes, who had a feeling for the composition and organization of forms of matter and life, and offered them the pleasures that exacting standards can give. The results are not to be measured only by what such men have found out and added to civilization. The pure scientists who have dealt in theory, and the men who have made the practical applications, the medical men, the engineers, the geologists, and to some degree the inventors, have shown themselves among the most disciplined elements in our communities. Seldom are they to be found among those with the quick cure-alls and the touching faith in the common man.—*American Scientist*, October, 1944, page 258.

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[a] There would be less than one chance in a million that a male square would be as large as or larger than a female square, if the two were selected at random.

E.C.P.D. DISCUSSES WAR *and* POST-WAR *at* ITS ANNUAL MEETING

AT THE 1944 Annual Meeting of the Engineers' Council for Professional Development, which was held in the Engineering Societies Building, New York, N. Y., on October 20 and 21, E. S. Lee, member A.S.M.E., engineer of the general engineering laboratory, General Electric Company, Schenectady, N. Y., was re-elected chairman, and James W. Parker, past-president A.S.M.E., president, general manager, and director, The Detroit Edison Company, Detroit, Mich., was re-elected vice-chairman. R. L. Sackett, fellow A.S.M.E., assistant to the Secretary, A.S.M.E., New York, N. Y., and George T. Seabury, secretary A.S.C.E., were elected secretary and assistant secretary, respectively.

For chairmen of E.C.P.D. committees the following elections were announced: Committee on Student Selection and Guidance, A. R. Cullimore, member A.S.M.E.; Committee on Engineering Schools, D. B. Prentice, member A.S.M.E.; Committee on Professional Training, C. A. Pohl; Committee on Professional Recognition, N. W. Dougherty.

The following appointments to committees were announced: To the Committee on Student Selection and Guidance, Z. G. Deutsch (A.I.Ch.E.) and Howard C. Madsen (S.P.E.E.); to the Committee on Engineering Schools, R. S. McBride (A.I.Ch.E.) and D. B. Prentice (A.S.M.E.), reappointments; to the Committee on Professional Training, C. A. Pohl (A.S.C.E.) and O. B. Schier (A.S.M.E.), both reappointments, and S. D. Kirkpatrick, (A.I.Ch.E.); to the Committee on Professional Recognition, A. R. Stevenson, Jr., and H. T. Heald.

Representatives to E.C.P.D. appointed by the constituent bodies were announced as follows: S. C. Hollister, A.S.C.E.; W. R. Chedsey (reappointment) A.I.M.E.; J. W. Parker (reappointment) A.S.M.E.; E. C. Stone, A.I.E.E.; S. D. Kirkpatrick (reappointment), A.I.Ch.E.; H. S. Rogers, S.P.E.E.; C. J. Mackenzie, E.I.C.; and Carl L. Svensen, N.C.S.B.E.E.

Serving on the Executive Committee E.C.P.D. for the coming year will be: George W. Burpee, A.S.C.E.; W. B. Plank, A.I.M.E.; R. L. Goetzenberger, A.S.M.E.; O. W. Eshbach, A.I.E.E.; S. D. Kirkpatrick, A.I.Ch.E.; D. B. Prentice, S.P.E.E.; C. R. Young, E.I.C.; and C. C. Knipmeyer, N.C.S.B.E.E.; and the chairman, vice-chairman, secretary, and assistant secretary of E.C.P.D.

The opening session of the 1944 Annual Meeting, at which E. S. Lee, chairman, presided, was held on the morning of October 20. Following the election of officers and the reading of the committee appointments as reported in the foregoing paragraphs, the several committees of the Council presented their annual reports. A recess was taken for luncheon at the Engineers' Club and the meeting reconvened in the afternoon. The annual dinner, held at the Engineers' Club Friday evening, E. S. Lee, presiding, was addressed by George G. Brown, president, A.I.Ch.E., C. E. Davis, secretary, A.S.M.E., C. R. Young, E.I.C., and George W. Burpee, A.S.C.E.

On Saturday morning the Council reconvened to listen to reports of the representatives of the constituent bodies and to the annual report of E.C.P.D. A closed session of the Committee on Engineering Schools followed.

STUDENT SELECTION AND GUIDANCE

The report of the Committee on Student Selection and Guidance was presented by the chairman, A. R. Cullimore. The committee had concerned itself with two projects during the year: (1) Advisement, counseling, and guidance of students about to enter college, and (2) the development of a battery of tests to aid in the proper selection of students for engineering.

Advisement, counseling, and guidance had been carried out by a subcommittee whose members had interested themselves in making contacts with prospective students individually and in groups and in distributing "Engineering as a Career." The scope of the work had been extended during the year. In all, 5000 copies of the pamphlet "Engineering as a Career" had been distributed, exclusive of 2000 copies distributed to the Army through the Science and Research Associates, and others through the Veterans' Administration, in whose opinion the pamphlet "is the best of its kind which they have seen." The Committee envisioned a great responsibility toward returning veterans and in their advisement. It was planned to extend this veterans' service greatly. Adequate service to veterans, the report said, would involve expansion of the subcommittee structure and costs in excess of normal, but it would seem of "primary importance to control, and as carefully as may be select, not only our college freshman but advise others as to the technical training and requirements for engineering aides and associates."

The Measurement and Guidance Project, undertaken under the sponsorship of E.C.P.D.-S.P.E.E. and under the direction of the Carnegie Foundation for the Advancement of Teaching with Dr. K. W. Vaughn as director of the project, was reviewed in the report, and the personnel of the advisory committee, the committee of consultants, and the measurement committee were named.

On Sept. 29, 1943, the report said, Dr. Vaughn had been appointed special consultant to the Army Specialized Training Division. The project had co-operated officially with the A.S.T.D., completed several researches into the effectiveness of selection tests, and assisted in editing test materials and in preparing official manuals for A.S.T.D.

Since March, 1944, the project office had co-operated with the Veterans' Administration in certain testing and guidance centers in Newark College of Engineering and the College of the City of New York.

During the coming year it was expected that Dr. Vaughn would prepare a special report describing achievement examinations. In regard to the number of tests administered by the staff of the project, the report stated that during two months (July 1 to Aug. 20, 1944) tests had been given to 3150 students, representing 22,000 tests, as against 27,000 tests in the previous 12-month period.

ENGINEERING SCHOOLS

In presenting the report of the Committee on Engineering Schools, D. B. Prentice, chairman, stated that the number of inspections of curricula had been kept at a minimum because the committee believed that engineering colleges would not be fairly judged while operating under war conditions. A few inspections had been necessary to complete studies already begun or to prevent injustices. During the last year 13 curricula at six institutions had been investigated and special consideration had been given to eight curricula at other institutions. The committee recommended that the provisional accrediting of 35 curricula at 17 schools be extended. Tables in the report recorded the present status of the accrediting program.

The subcommittee on Technical Institutes, H. P. Hammond, chairman, had completed an inclusive study of the present status of education of the technical-institute type in April, 1944. The report of that subcommittee had recommended that recog-

nition or certification of programs of technical-institute type be initiated by the Engineers' Council for Professional Development, and said that "it would be appropriate at the beginning to trust the organization of the movement to the Committee on Engineering Schools." It further recommended that under E.C.P.D. auspices an accrediting group be set up to include representatives of the technical institutes and of the industries they serve, and that these representatives have as large a share as possible in conducting accrediting procedures. After it had presented the report referred to the subcommittee had been asked to prepare an "outline of criteria and procedure for accrediting technical-institute programs." The subcommittee's statements prepared as a result of this request had been favorably received by the executive committee of E.C.P.D. and presented to the boards of direction of the E.C.P.D. constituent bodies for approval. Approval had been received from all bodies except N.C.S.B.E.E. which had not held a meeting up to the time the report was prepared, although informal indications of probable approval had been received. The "suggested basis for accrediting educational programs of the technical-institute type," prepared by the subcommittee, were quoted in the report of the Committee on Engineering Schools, which at its meeting of June 25, 1944, had expressed its appreciation of the work of the subcommittee. In the opinion of the Committee on Engineering Schools, as noted in its report, an interim subcommittee should be appointed to bridge over the war period and to formulate plans for the program of accrediting technical-institute curricula. The personnel of this subcommittee had been recommended to the Council for approval. The Council approved the personnel recommended by the Committee on Engineering Schools.

Continuing, the report of the Committee on Engineering Schools recorded progress made in the solution of specific problems—multiplication of curricula; admission, teaching, and graduate standards; and excessive credit for correspondence courses. It also discussed war and postwar programs, such as credit for Army and Navy curricula, Armed Forces Institute, military service, and other wartime training, and standards for the admission of veterans, the veteran rehabilitation program, the effect of reduced enrollment on accredited curricula, and the policy to be pursued in connection with the inspection program.

Approval was voted of additional personnel to certain regional committees involved in accrediting to advise on petroleum and ceramic-engineering curricula.

At the request of the American Institute of Chemical Engineers it was voted to publish as the accredited curricula in chemical engineering the list of 1943 with a note calling attention to this date.

Endorsement was voted of the S.P.E.E. Committee on Engineering Education After the War, and it was suggested that copies of the report be sent to the chairmen of the committees on education of the constituent bodies.

PROFESSIONAL TRAINING

The report of the Committee on Professional Training was presented for the senior committee, John C. Arnell, chairman, and the junior committee, F. J. Antwerpen, chairman, by John T. Sherman. Activities of the committee during the last year had been in two directions, revision of the Reading List for Junior Engineers, and preparation of a Manual for Junior Engineers.

The original reading list had been prepared in 1936. In the revision the committee had attempted to eliminate books not readily obtainable in public libraries, textbooks, and encyclopedic works. It had been thought advisable to eliminate also modern "best sellers," but a systematic method had been devised to include these after a period of time. Each year the Junior Committee would include in a mimeographed addition to the printed list five current best sellers. After five years on the addenda a book would be eligible for transfer to the printed list or for elimination. With revision every five years, 25 to 45 books would be maintained on the mimeographed addenda to the printed lists.

It was reported that the Manual for Junior Engineers was in preparation, and that Dr. W. E. Wickenden, who had accepted authorship, had devoted considerable time and effort to the project. A telegram from Dr. Wickenden was read saying that the material for the manual was two thirds and the manuscript one quarter complete.

PROFESSIONAL RECOGNITION

The report of the Committee on Professional Recognition, C. F. Scott, chairman, stated that the "general objectives" of the committee had been laid on the table and that immediate efforts had been directed to the young engineer, particularly in the engineering schools.

Co-operation between E.C.P.D. and S.P.E.E. committees had resulted in the sending to faculty sponsors of student organizations of the national engineering societies a letter signed by C. F. Scott and Ivan C. Crawford, chairman S.P.E.E. Coordinate Committee in Personal Development, in which reasons were given for cultivating professional development in the schools, pointing out the fact that in this program the student-branch counselor occupied a key position, offering the assistance of the committee as a clearing house, and asking for suggestions and comments.

Attention was drawn to the participation of the two committees in the 1944 S.P.E.E. convention which resulted in a resolution to ask the S.P.E.E. Council to appoint a committee, subsequently appointed, to put the project on a permanent basis.

In the conclusion of the report it was stated that "the attitude, interest, and action attested by the S.P.E.E. convention and the avidity with which the new version of the 'Second Mile' is being received shows that educators are becoming alert to the problems of the profession."

Dean Dougherty, incoming chairman of the Committee on Professional Recognition, outlined some of the problems facing the committee in its future work. He pointed out that the task of achieving recognition was more complicated than the title would indicate. By whom did the profession wish to be recognized? One way of partially solving the problem would be provided by definition. Before the registration movement could be established on solid ground, engineers would have to define their activities. The problem had not been sidestepped, he said, but difficulties had been encountered.

Obviously, recognition had many implications, he said. As a result of engineering services in the war effort, now was a good time, he asserted, to increase public esteem by modestly calling attention of the nation to engineering accomplishments.

The committee, Dean Dougherty continued, sought profitable return to its original objective of getting uniformity in nomenclature and possibly defining a method of minimum recognition. The committee would continue, he concluded, the path oriented by its predecessors and would undertake to find a way to remove some of the other barriers which had blocked the way to professional unity.

PRINCIPLES OF ENGINEERING ETHICS

Slow progress in the approval of the proposed Canons of Ethics was reported by D. C. Jackson, chairman, Committee on Principles of Engineering Ethics. It was stated that no change had occurred in the approval action of S.P.E.E., A.I.E.E., and A.I.C.E.; that discussion of the Canons was continuing in A.S.C.E.; that the A.S.M.E. still had the matter under consideration; that action taken by E.I.C. had not yet been received by E.C.P.D.; that the N.C.S.B.E.E. had adhered to the view that a shorter code was needed; and that no action had been reported during the year by A.I.Ch.E. or A.I.M.E. It was also reported that the document entitled "Faith of the Engi-

neer" had received favorable comment from college deans and from college students.

In accepting the report the Board voted to request the three participating bodies that had not acted on the report of the Committee on Principles of Engineering Ethics to do so.

EMPLOYMENT CONDITIONS FOR ENGINEERS

The report of the Committee on Employment conditions for Engineers, Van Tuyl Boughton, chairman, reviewed progress in the steps taken by the A.S.C.E. to facilitate organization of collective-bargaining groups among professional engineering employees, the developments in Canada and the Tennessee Valley Authority, and the exploratory studies undertaken by the joint A.S.M.E.–A.I.E.E. committee. Because the report offers a concise review of these matters, it is being published in full and will be found on pages 809–812 of this issue.

OTHER COMMITTEE REPORTS

Among other committees reporting at the meeting was the Committee on Information which had issued two general releases during the year and copies of various special publications of the Council.

The Special Committee on Representation of Other Organizations in E.C.P.D., W. B. Plank, chairman, submitted a report, endorsed by the Executive Committee, which contained recommendations, to the effect that

1 Until the joint conference of the Engineering Societies determines the conditions of association in professional matters with other engineering societies, the E.C.P.D. would be unwise to make any move in that direction.

2 Before any additional engineering society be invited into participation in the E.C.P.D., if the field of that society be related to the field of any existing participating society, then the matter be referred to that participating society for its approval.

3 The Committee on Engineering Schools should see that on each delegatory committee there is at least one qualified representative of each curriculum to be considered for accrediting.

4 All national engineering societies in the United States and Canada be placed on the mailing list to receive E.C.P.D. reports and other literature.

The Special Committee on Rules of Procedure-Representation suggested a clarification of a statement relating to membership on standing committees.

The Special Committee on Special Contributions to E.C.P.D., George W. Burpee, chairman, offered the following resolution, which was voted by the Council:

Engineers' Council for Professional Development hereby authorizes the Chairman, subject to the approval of the Executive Committee in each instance, to solicit from sources other than the participating bodies such funds for the furtherance of the general objectives or specific projects of Engineers' Council for Professional Development as in his judgment may be necessary or desirable and likewise to receive and use for the foregoing purposes such contributions as may freely be offered and in his opinion may properly be so received and used.

REPORTS OF REPRESENTATIVES OF PARTICIPATING BODIES

A.S.C.E. A portion of the program of an E.C.P.D. annual meeting is always devoted to reports and recommendations of the representatives of the participating societies. The representatives of the American Society of Civil Engineers made four suggestions in their report.

1 A review of the proposed "Canons of Ethics" to distinguish between a Code of Ethics and a Code of Practice.

2 An effort to establish and secure recognition of the status of "engineer in training" to designate one who definitely intends to qualify for registration as a professional engineer.

3 Consideration of all suggested revisions of engineering curricula with a view to increasing the proportion of literary and social-science studies.

4 Preparation of a program for reconciling the requirements of national defense and the needs for educated citizens.

A.I.M.E. It was reported by representatives of the American Institute of Mining and Metallurgical Engineers that the board of directors of that society had approved a recommendation to set up a War Committee on Technologic Manpower under the chairmanship of John L. Christie. This committee had undertaken to study the effects of the war on technologic manpower in the mineral industry and would report to the board on the present employment situation in that industry and the enrollment situation in mineral-engineering schools. Evidences of the Institute's activities in fields of interest to E.C.P.D. were cited. It was reported that the Institute planned to discuss at its coming annual meeting a program of service to its members who will return from the armed forces and to those in foreign countries who have been shut off from professional associations because of the war.

A.S.M.E. Efforts to initiate studies of the employment conditions of engineers, the plan of the Joint Conference Committee of presidents, junior past-presidents, and secretaries of five national engineering societies to integrate the engineering profession, and steps toward closer co-operation of local sections of engineering societies and student branches, were among the activities reported by the A.S.M.E. representatives.

A.I.E.E. The representatives of the American Institute of Electrical Engineers reported that a request to the Institute by the Board of Examiners to determine whether Melbourne University (Australia) came within the usual interpretation in this country of a school of recognized standing had been transmitted to the E.C.P.D. Committee on Engineering Schools, which had provided the opinion desired. Various E.C.P.D. publications were distributed by the Institute and the activities of the Council were publicized to its members.

S.P.E.E. A report on the activities of the Society for the Promotion of Engineering Education noted, among other things, meetings of the Army and Navy College Training Advisory Committee, the work of a committee on academic credit for in-service training, the report of the Committee on Engineering Education After the War, and co-operation with E.C.P.D., particularly through the E.C.P.D. Committee on Engineering Schools.

N.C.S.B.E.E. Some problems which confront the National Council of State Boards of Engineering Examiners were outlined in the report of that body. It was announced that at its 1944 meeting N.C.S.B.E.E. would give consideration to the proposed Canons of Ethics.

E.I.C. The Engineering Institute of Canada reported that its brochure, "The Profession of Engineering in Canada," had gone into its second edition and that copies of it had been widely distributed. A French edition had been placed in the French language schools. A special edition had been prepared for the Canadian Legion Educational Services and copies had been made available to all the armed services.

Personal guidance by interview had been provided through student-branch-guidance committees. Moreover, the report stated, the Dominion Government had asked E.I.C. to provide counselors for the assistance of District Rehabilitation Boards throughout Canada in advising young men who intended to continue the study of engineering. The Institute had made the services of local counseling committees available for this work.

The Institute, with two other Canadian organizations, was preparing to extend its work of guidance and selection through the Canadian Committee for Student Guidance in Science and Engineering. It continued to assist the Wartime Bureau of Technical Personnel in matters relating to engineering and science students.

Furtherance of professional recognition and training of the young engineer had been effected by the Institute through circulation of important and significant papers, and the Institute had encouraged the organization and activities of the newly organized Junior Section at Toronto and of the Junior Graduate Engineers' Association at Ottawa.

CHAIRMAN LEE REPORTS TO THE COUNCIL

Everett S. Lee, chairman of E.C.P.D., presented his report to the Council at its Saturday session. He paid warm tribute to the numerous standing and special committees and commented on their work. In introducing his report he said:

This has been another substantial year for E.C.P.D. The personal contributions to the work in this period of difficulty have been outstanding. The progress has been significant. The interest has been augmented. The scope has been expanded.

E.C.P.D. is still quite concentrated. Wherever I have had the opportunity to tell of the accomplishments of E.C.P.D., these have been received with acclaim. On the part of engineers in general the work of E.C.P.D. is not well known. When it becomes known, I find an eagerness by the engineers to want to aid in the work. We thus have an educational program to progress.

The E.C.P.D. "Will You Help?" pamphlet, written last year and circulated this year through the secretaries of the participating organizations, tells the story of opportunity for the engineers in their respective localities to co-ordinate and promote efforts to attain higher professional standards of education and practice, greater solidarity of the engineering profession, and greater effectiveness in dealing with technical, economic, and social problems.

WHAT IS AHEAD FOR ENGINEERING EDUCATION? THEME OF E.C.P.D. ANNUAL DINNER

At the annual dinner of the Engineers' Council for Professional Development, which was held at the Engineers' Club, New York, N. Y., on Friday evening, Oct. 20, 1944, Everett S. Lee, chairman E.C.P.D., acted as toastmaster. In line with a custom originated by Col. C. E. Davies, secretary, A.S.M.E., and successfully maintained last year by S. D. Kirkpatrick, Mr. Lee introduced every one of the 67 persons present at the dinner. He was warmly applauded for his feat.

ADDRESS BY G. G. BROWN

The central theme of the address and discussions which followed the dinner was, "What Is Ahead for Engineering Education?" The principal address was presented by Dr. George G. Brown, of the University of Michigan, president A.I.Ch.E.

Dr. Brown began by asking the question, "What do we mean by education?" The answer he provided was a quotation from an address delivered before the American Institute of Chemical Engineers by Dr. W. E. Wickenden, president, Case School of Applied Science. Dr. Wickenden on that occasion had recalled the "lofty mark" set by the poet Milton, "I call, therefore, a complete and generous education that which fits a man to perform justly, skillfully, and magnanimously all the offices both public and private of peace and war." Dr. Wickenden had then taken Milton's criteria, point by point, and had shown that, by such standards, engineering education had been a success.

Dr. Brown's second question was, "Where does engineering education stand in relation to the so-called liberal education?" Since the days of Aristotle, he asserted, there had always been conflict in the educational world. The present conflict, he said, had been pointed out by John Dewey in a recent article in *Fortune*. In the present conflict, according to Professor Dewey, there was an assault on what is "modern and practical" in education. This assault was best summarized in the words of Robert Hutchins, president, University of Chicago, "An educational system which does not make the questions of what is ultimately good and bad in human life and institutions the center of its attention is not an educational system at all. It must be clear that though we can and should use science to achieve social improvement, we cannot follow it to this destination. The reason is science does not tell us where to go. Men may employ it for good or evil purposes; but it is the men that have the purposes, and they do not learn them from their scientific studies."

Looking at the basis of "liberal" education in "literary subjects which are asserted to be truly humanistic and the only source of what is ultimately good," Dr. Brown found that basis in ancient Greece where free men were supported by a slave population skilled in the practical operations required of industry. "The small class that enjoyed the privileges of freedom and a liberal education," he said, "was based upon precisely those considerations that modern liberation has steadily striven to wipe out. A status fixed at and by birth, sex, and economic conditions is just what democratic societies regard as illiberal."

Turning to another school of thought, Dr. Brown quoted from John Dewey to the effect that certain factors at work in contemporary life were of transcendent value in promise, if not yet in achievement. These were: (1) Experimental science and experimental method in the field of knowledge; (2) the democratic spirit in human relations; and (3) technological control of the energies of nature in behalf of humane ends. These three factors listed by Dewey, Dr. Brown asserted, "are the distinguishing characteristics of modern American engineering education and what we are pleased to call the engineering method, and are completely absent in the so-called liberal literary field." This, then, was the controversy as Dr. Brown saw it. "Let us face it squarely," he said, "and recognize that the success of the engineering method in material things may be exceeded in the future by the success of the engineering method in human relations or the humanities."

The controversy, the challenge, and the opportunity were clear, Dr. Brown pointed out. What was ahead? For his part, the objects of an engineering curriculum were to develop in the student:

1 An understanding of the scientific principles and facts upon which his profession is based.

2 A facility in thinking and expressing his ideas.

3 An appreciation of and skill in the experimental method as a means of finding the truth.

4 Sound principles of honesty, fairness, and the democratic spirit with some appreciation of the human and economic problems of modern society.

5 The beginnings of a philosophy and integration of skills in using the materials and energy of nature for the benefit of mankind.

Dr. Brown expanded these points and dwelt at some length on the teaching of English to engineering students. Insistence upon clear effective expression, he said, must come from the engineering instructor; it could not be relegated to the teacher of English, drawing, or mathematics. Nothing could be more disastrous to effective expression than an engineering instructor who was careless or sloppy in his speech, sketches, or writings. The example was set by the *professional* teacher, not the English teacher, he contended.

On the subject of vocational training, Dr. Brown's opinion was that it should be regarded not only as an end but also as a preparation for further education such as engineering or literature for those competent. The youth who enters a vocational school at 14 early learns from practice; and later, when his interest expands he should be "offered the opportunity to explore the more advanced phases of science or engineering, the pleasures of art, music, and literature, and the fields of economics or politics, or all of these, according to his capacity and interests, and while still contributing his labor to the world's work, or not," Dr. Brown asserted.

Dr. Brown's address concluded with some brief remarks on educational policy in respect to returning veterans.

DEAN YOUNG ON THE CANADIAN VIEWPOINT

Dean C. R. Young, of the University of Toronto and representative on E.C.P.D. of The Engineering Institute of Canada, was asked by Mr. Lee to comment on Dr. Brown's address, with particular reference to the Canadian viewpoint. Dean Young spoke extemporaneously and with his customary skill and charm.

He was glad, he said, that Dr. Brown had brought out the relationship of engineering education to the cultural field, which was a controversial subject. Steps had been taken in his university, he said, that were leading toward liberalization of the engineering curricula, but the arts men thought it was improper for engineers to abrogate to themselves what had belonged to the college of liberal arts.

How Aristotelian theories had been "given a wallop" by Roger Bacon, who sounded a new note by asserting that men learned by experiment, and how Francis Bacon had furthered this idea was contrasted by Dean Young with the ancient Greek preference for argumentation and for considering science a toy, applied principally in mystic rites. Today, science was being applied to the interest of man, and engineers were concerned with the needs of men. They learned the principles of science, Dean Young pointed out, but they also learned the practical uses of science for human needs.

We were entering a new era, Dean Young said. As a result of the war the prestige of science and engineering was high. People generally would soon have a greater appreciation of the value of a scientific background.

Men were more interested in the things of the spirit when they became mature, he asserted. Practical matters engaged their interests as young men, but after three or four years of training they saw more in engineering than "tinkering with mechanisms" and acquired an appreciation of these more important matters. The basis for this appreciation, he said, was laid in the college.

He was concerned with the possibility that it might be necessary, in the case of men returning from the war, to trim some of the humanistic areas of the education they otherwise would have enjoyed. With this incomplete educational experience it was possible that they would develop into technicians without the liberality of outlook of truly professional men. Haste and pressure were characteristics of the educational programs for these men.

There was a tremendous load on the colleges of Canada, he reported, and particularly in the science courses, because the people have witnessed the power of science and technology. There were, he said in conclusion, no grounds for looking on education with the cynicism of Sidney Smith, who had viewed it as a "growth of vice and a waste of money."

GEORGE W. BURPEE ON INDUSTRY'S VIEW

In discussing Dr. Brown's address from the viewpoint of industry, George W. Burpee, representative on the Council of the American Society of Civil Engineers, said his mind kept turning on the subject of what industry would like to lie ahead in engineering education, rather than what industry might think does lie ahead.

Turning first to what probably lay head, Mr. Burpee reminded his audience that, after the war, boys whose college education had been cut short would be returning to enter engineering work. These boys, he said, would have as much intelligence, initiative, imagination, and judgment as if they had gone to college or finished their courses. They would be shy on general scientific theory and long on special applications. To supplement shorter courses to provide a minimum of technical knowledge as a basis for earning a living, it was to be expected that industry would provide specialized training courses to carry them further in theory. It would be well, Mr. Burpee said, if industry would also provide means for these students to increase their knowledge of literature, history, and economics.

In his opinion the kind of education industry would like for engineers would be one based on preparation for leadership. Leadership in industry, he asserted, was going more and more to the engineer. It was not so many years ago that many big businesses did not want college men because they were too "idealistic," and too little aware of the value of the dollar. However, in general today, he said, industry had become so much the product of engineering that the engineering route was the logical route to the top.

The limitations of education, he admitted, were well understood. The qualities that made for greatness were largely or wholly inborn and education could make few fundamental changes. But education should provide a set of standards and teach a student to make best use of such talents as had been given him; it should give him a sense of relative values and stimulate the faculty of discrimination; and it should give him the proper attitude toward life and toward his work as a part of his life.

Industry, he said, did not expect a young graduate to be a specialist. It did expect him to have some knowledge that would enable him to make his way at the start and it hoped that he had within him qualities that would bring him to the top where his contribution could be great.

In Mr. Burpee's opinion the engineering college, in equipping young men for industry should: (1) Teach him sufficient history to enable him to have some understanding of his background; (2) teach enough social science and philosophy to help him find himself in relation to society; (3) emphasize the importance of the use of language to express ideas; and (4) give him inspiration.

Mr. Burpee said that a marked characteristic of present engineering education was the closer co-operation between industry and engineering colleges. This was all to the good. In his opinion it was best that the engineering colleges should stress the cultural background and inspirational subjects, not relaxing on discipline, and leave specialization until the student had come into contact with industry and had a better comprehension of the subjects in which he wished to specialize.

The great desideration of industry, he said in closing, was that the college graduate would be imbued with sufficient knowledge to earn his living at the start of his career and sufficient inspiration to put his shoulder to the wheel and prove that he had a right to his place in the sun.

COL. DAVIES ON THE SOCIETIES' VIEWPOINT

Making it clear that he was speaking for himself in accepting Mr. Lee's invitation to give the viewpoint of the societies on the question, What is ahead in engineering education, Col. C. E. Davies, secretary of The American Society of Mechanical Engineers said that the educational function and professional responsibility were completely linked. It had been the traditional job of the societies, he explained, to stimulate the education the engineer got on his own account and to encourage the self-development of young engineers.

One way in which this task could be advanced, said Colonel Davies, was to see to it that the professional point of view was brought to the E.C.P.D. more frequently. There were many men representing industry at the dinner which he was addressing and it was fortunate that both the chairman and vice-chairman of E.C.P.D. were from industry. Engineering educators understood the problem of the development of the young man—the difficulty lay in getting industry interested in it. One of the functions of the Committee on Engineering Schools, as stated in the Charter, was to report to E.C.P.D. means by which co-operation between industry and education could be brought about.

Colonel Davies commended highly the report of the S.P.E.E. Committee on Engineering Education After the War, published in MECHANICAL ENGINEERING for June, 1944. The thinking represented in this report, he said, should be reflected in every industry. He would like to see the report discussed and argued broadly. The development of two parallel stems of curriculum content—the technological and the humanistic—should be made to come to pass. The large influx of students in the engineering colleges, he said in closing, laid heavy responsibilities on the professional engineering societies.—G.A.S.

EMPLOYMENT CONDITIONS *for* ENGINEERS[1]

A Report to E.C.P.D. Presented October 20, 1944

THE principal developments during the past year affecting employment conditions for engineers were the steps taken by the American Society of Civil Engineers to facilitate the organization of collective-bargaining groups among professional engineering employees and the temporary exclusion of engineers in Canada from the provisions of a Dominion Order-in-Council providing for collective bargaining in war industries in order to give engineers an opportunity to recommend how they would like to be classified under that order.

The original action of the A.S.C.E. was reported briefly in last year's report of this committee, having been taken at the October, 1943, meeting of the Board of Direction. Upon the advice of legal counsel that action was materially modified in March of this year. Under the modified plan, any local section of the society may amend its constitution to provide for a standing committee on employment conditions, which committee will organize groups of "professional engineering employees." These groups may include any "professional engineering employee," as defined in the board's original action, resident within the section's boundaries, regardless of membership in the A.S.C.E. These groups, in turn, are authorized to organize collective-bargaining "units" among the professional engineering employees of any one company.

EXPERIENCES OF A.S.C.E.

Up to July 15, 1944, 30 of the society's 64 local sections had amended their constitutions to provide for putting the plan into effect, five had rejected the proposal by vote of the section members, and in five the Board of Direction had decided not to submit the proposed plan to vote. Actual organization of the committees has been slow except in the Tennessee Valley Section where an attempt on the part of the American Federation of Labor to organize the engineers employed on construction of the Clinton Engineering Works made prompt action necessary.

In the Tennessee Valley Section an organization known as the Tennessee Association of Professional Engineering Employees (TAPEE) was set up to include civil, electrical, mechanical, and chemical engineers employed by the prime contractors for the Clinton Engineering Works, and collective-bargaining agreements were signed with two of the contractors. These agreements were challenged by the International Federation of Technical Engineers', Architects', and Draftsmen's unions (AFL) which was attempting to organize all the technical men on the project. The question of whether professional engineers may be separately represented is now before the War Labor Board.

In this action the A.S.C.E. engaged the same legal counsel who represented the American Chemical Society so successfully last year in its efforts to have its members excluded from the nonprofessional collective-bargaining groups.

What the A.S.C.E. is now attempting to attain at the Clinton Engineering Works is an amplification of what the A.C.S. has already established. The A.C.S. established the fact that professional men cannot be compelled to join collective-bargaining units made up of nonprofessional men. This, however, leaves them without a collective-bargaining agency to represent them before their employers if they are in difficulties with respect to compensation or working conditions. The A.S.C.E. now is attempting to get the War Labor Board to recognize that these professional men can set up their own collective-bargaining unit made up of "professional engineering employees" to act for them under the National Labor Relations Act, the so-called Wagner Act.

ECONOMIC STATUS OF THE ENGINEER

Many engineers believe that the Wagner Act should be amended to exclude all professional engineers from its collective-bargaining provisions. To study that question, the Board of Direction of the A.S.C.E., in January, 1944, authorized the president to inaugurate a study of how such an amendment might be obtained.

Meanwhile, because of growing uncertainty among young men in the American Institute of Electrical Engineers and The American Society of Mechanical Engineers as to their economic position under present conditions these two societies undertook a joint study of the economic status of the engineer and engaged the National Industrial Conference Board to make an exploratory study to determine whether it could assemble and evaluate the data needed for such a study. As such a study appeared to the board of the A.S.C.E. as a necessary part of concerted effort on the part of the engineering profession to have its members excluded from the provisions of the Wagner Act, it voted to join with the other two societies in financing the study if it proved to be feasible. At a later date the Conference Board reported that undertaking such a study at the present time does not appear feasible due to the abnormal conditions created by the war. Consequently, that study has been postponed.

COLLECTIVE BARGAINING IN CANADA

In February, 1944, the Canadian government, by Order-in-Council, made collective bargaining obligatory in practically all industries in Canada as a war measure. The Order applied to all employees except those employed "in a confidential capacity and those having authority to employ or discharge employees." As this left the status of professional men in doubt, the engineering and allied organizations of Canada, in April, appealed to the newly created Wartime Labor Relations Board for exemption of their members as being employed in a confidential capacity, the exemption to last for a sufficient length of time for the organization to determine the views of their members on what their status should be under the order. As a result, a six-months' exemption was granted and the dominion and provincial associations now are engaged in a canvass of their members as to their wishes.

In Ontario, before the matter was taken up with the Wartime Labor Relations Board, the council of the provincial association of professional engineers had decided that some form of collective bargaining was necessary for engineers in that province as the only means for protecting their rights. Consequently, the vote in Ontario was not on the question of

(*Continued on page 812*)

[1] The E.C.P.D. Committee on Employment Conditions which prepared this report consists of Van Tuyl Boughton, chairman, Zola G. Deutsch, J. D. Guillemette, Gibb Gilchrist, E. G. Hewson, Warner Seely, W. R. Smith, and A. L. Walker.

EDUCATION *for* SAFETY

What the Engineering Societies Can Do To Encourage Safety Education in Technical Schools and Colleges

By WALTER A. CUTTER

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IT IS a matter of great encouragement that The American Society of Mechanical Engineers is giving time on this occasion to consideration of safety education. During the last decade, and more strikingly since the beginning of the present war, safety has been given a prominence in this country totally without precedent. Not only is the whole field of safety attracting widespread interest and support, but a special phase of the field, the training of safety engineers, is receiving substantial attention by various bodies. This active interest in the future development of safety education, and the advances which are being made, put us all under a mandate to conserve our gains and chart a course whose direction is based on sound principles. This occasion, therefore, is one of more than usual significance.

WHY IS A.S.M.E. INTERESTED IN SAFETY?

One may ask: Why is The American Society of Mechanical Engineers displaying this special interest in safety education? Certainly this branch of engineering education has reached a high level of excellence, while the creations for which mechanical engineers are responsible are ordinarily regarded, as being more than reasonably safe. In the realm of accidents, the relative proportion of accidents with a direct mechanical cause and those with a human cause appears at first to be heavily in your favor. Why then this interest?

My own answer to this question is twofold. First, you realize perhaps, that your own work needs constant improvement. This is said because you must know that a mechanical device, properly assembled and installed, surrounded by all needed safeguards, demanding excellence from its operation and calling for highly efficient supervision of the operation, is in itself a continuous lesson in safety. Second, and perhaps more important, you may have reached the decision that in the whole accident picture it is the man much more often than the machine who is at fault. Your interest is doubtless twofold. You have an interest in improving your own work and an interest in enlarging your capacities for dealing with the human element. Progress must be made in both categories—the machine and the man. But whether we find the subject congenial or not, it is with the man that our greater progress will be made.

Safety education, broadly conceived and comprehensively applied, is an imperative. Your interest is logical and timely. In making the following suggestions to you, no distinction is made between technical and semitechnical schools and colleges, since any needed modifications may be made in approaching particular institutions.

SPECIFIC WAYS IN WHICH SAFETY EDUCATION MAY BE ENCOURAGED

1 *Integrate safe practices, "safe" supervision, safety consciousness (an understanding of the mission of safety) in every course, in every shop and laboratory, and in every operation therein; and use only equipment and machines which have the utmost in mechanical safeguarding designed into them.*

Safety is not an abstract "something," apart from our actions and the devices with which we work. It "belongs" in each of them. Thus it should be emphasized constantly as an indispensable part of all that we do, and all that we do with, rather than as something "added on."

2 *Instill the viewpoint that accidents are mechanical and human faults, and like any other fault can be corrected.*

Accidents have been viewed too long as an ordained part of the cosmic scheme. This is a rather "sublime" view and many persons take a gloomy pleasure in holding such a view. It serves as an excuse. The plain truth is that accidents are really but ordinary faults and as such lend themselves to correction.

3 *Stress at the same time the related facts that safety in mechanics, in operations, and in individuals is the normal state and that accidents are abnormal.*

To argue that accidents are "normal" is to argue that we cannot learn. That *all* accidents will ever be prevented is doubtful, because we may lack the desire or the means to prevent them, or we may be willing to gamble that they won't happen. Our belief and practice must be, generally, that the maximum possible efficiency in men and means will maintain this normal condition of freedom from accidents.

4 *From the strictly engineering point of view, emphasize the wastefulness and the inefficiency of accidents.*

Accidents waste men and material. Ten per cent of all accidents are said to have a prime mechanical cause. This proportion, however, should bring small comfort for the reason that these accidents usually cause a higher severity to both men and material. Eighty-eight per cent of all accidents are said to have a human cause. The wastefulness, both from a human and material standpoint, staggers the imagination. Engineering thoroughness can be applied to improving both the man and the machine, in order that this staggering waste may be drastically reduced.

5 *In aiding the programs of technical schools and colleges, the engineering societies must insist that there should be added to the technical curriculum a considerable body of subject matter dealing with that knowledge which we have gathered under the term "psychology."*

If we are really to advance in safety education by helping to make technical schools and colleges—and their human products—safer and more conscious of safety, it is quite obvious that this point is of primary importance. Learning about people—why they do as they do and how their behavior can be changed—becomes one of the primary objectives of safety education. The psychology of accident prevention assumes, therefore, an importance equal to, if not more than, the purely mechanical aspects of accident prevention. While the operations of men will never approach the kind of efficiency which characterizes the machines which they create, man's total efficiency, including his capacities and his attitudes, can be changed so

Contributed by the Safety Committee and presented at the Annual Meeting, New York, N. Y., Nov. 27–Dec. 1, 1944, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

that his efficiency will be increased and his proneness to accidents decreased.

The question may arise in your minds: Does this type of knowledge really need to be taught, or can it be learned as well by experience? Naturally, a great deal of it can be learned by experience, but that is a very costly way of learning. Where would you gentlemen be today if you had to learn by experience all that you have got! You submitted to the discipline of an engineering school, in order that you might do what any intelligent man does—learn more quickly and more thoroughly from the experiences of others. Living itself is an art no less important than engineering, medical, or any other proficiency. And the roadway of life, to coin a phrase, is strewn with the wrecks of men who, whatever their degree of competence, did not know how to get along with people. So it may be taken for granted that this subject matter should be taught. But a practical question arises: Where can this "safety" emphasis, particularly in the form of special knowledge about men, be put in already overcrowded curricula? Here I quote from a recent publication of the Division of Labor Standards entitled "Safety Engineering in Colleges—Its Future," which is a brief report of the National Committee on Safety Engineering Education in Colleges.

Undergraduate Curriculum. It is suggested that safety be made an integral part of each engineering course in every college of engineering.

Graduate Courses. At a few colleges, well distributed geographically, provision should be made for one-year specialized graduate courses in safety engineering. Entrance requirements should include at least one year's experience in practical industrial safety work, in addition to graduation from an engineering school. In addition to this one-year residence course, it is suggested that other schools consider the offering of courses carrying graduate credits on an extension basis; the courses being either on an evening seminar basis over a long period of time, or in the form of intensive full-time residence courses of 3 to 6 weeks' duration.

Extension Courses. In addition to the above-mentioned graduate courses, it is suggested that noncredit courses be set up in industrial areas to train persons from local industrial establishments who have either full or part-time responsibility for safety.

In addition to the foregoing suggestions, there is another point of view which advocates the inclusion of "safety" subjects in the curricula of technical schools and colleges. This point of view does not discourage integration of safety in all subjects, but suggests additional subjects.

All of these points have merit, although the last mentioned would seem to have the least for very special reasons, unless these added subjects would deal with the basics of applied and experimental psychology and the fundamentals of safety organization and administration. In this case they would simply form a foundation on which experience could be intelligently built. The chief objection to this point of view is that, peculiarly, so-called "safety" subjects are best taught and learned in conjunction with practical experience or after such practical experience has been gained. Sound technical and engineering principles are one thing. Knowledge is gained in technical schools in how to apply these principles in meeting technical engineering problems. But when one comes to the practical field, the interplay of these mechanical features with the human elements in production, this whole interaction being colored by the nature and practices of given industries and particular processes, it is easy to see how necessary it is that experience should prepare the way for added knowledge and that added knowledge must inform experience.

Therefore, the soundest method apparently of introducing specific "safety" subjects would be *after* both technical training and practical experience have been gained, namely in a postgraduate year. For this reason, added training should *not* be given in a fifth consecutive year, but only after at least one year's practical training has been completed. While this point may seem relevant only to the specific training of safety engineers, its intent is directed to all engineers whose responsibilities will embrace the whole field of safety administration. It may be said that this point of view is the one taken by the College of Engineering at New York University.

6 *Take the societies to the schools and colleges.*

No matter how "practical" technical instruction is made, there always seems to be a gap between theory and practice. In fact, there is often a good bit of complaint about the distance between theory and practice. This is natural, since the application of a body of technical knowledge to a specific problem is often difficult and makes the recent graduate feel that perhaps he has not had enough orientation into the world as it is outside of school. This suggests several specific ways in which the engineering societies can be helpful:

(*a*) The societies should make arrangements for representatives to visit technical schools and colleges with some regularity, in order to speak to the classes or to the student chapters of the engineering societies on practical phases of their work. This will in itself tend to cut down the apparent space between theory and practice and give a clue to the students about what to expect out in practice. Similarly, the practical experience of the engineers can underline the importance of the various subjects and show how essential they are in practice.

May I suggest a word of friendly caution? This principle of practical co-operation is too logical to need defense, yet it doesn't always work. Why? Men when they embark on practical engineering careers tend to specialize, thereby narrowing their interests to some degree or other. They may see less need for subjects which they may not use in a major degree. The schools however must keep a balanced view, giving attention to the broad areas of training. They must strike a common denominator for men who are going into many lines. Therefore, keep this in mind when revisiting technical schools. Do not lose interest in this useful work because the school may not be giving what you regard as due emphasis to your specialty. There are many branches on the tree of engineering but the school must be concerned basically with the trunk. Such visits will be of maximum helpfulness when the visitor retains this balanced viewpoint.

One normal channel for excellent co-operative work between the societies and the schools is through the student chapters of the engineering societies. These provide a natural forum where the best in training and practice may be fused into a fine working combination.

(*b*) In appropriate industrial centers where educational facilities permit, groups of engineering instructors in safety education for extension courses, noncredit courses, special lectures, and other such efforts could be used. May this point be illustrated by reference to the Center for Safety Education at New York University. We follow the third suggestion of the National Committee on Safety Engineering Education in Colleges, by providing noncredit instruction for men and women employed in safety work of various kinds in business and industry. Some of these men have engineering degrees and are seeking such supplementary knowledge as has been previously advocated. Others without engineering degrees, but with practical experience, are seeking added knowledge with a view to upgrading.

For the larger part of such instruction the Center uses visiting instructors, mostly engineers who have built a fine safety experience on a solid technical foundation and who have given due consideration to the human aspects of the accident problem. This is done in other places in individual courses. There is little doubt that the engineering societies in co-operation with the schools could develop and extend such a useful educational supplement to conventional engineering training.

7 *Broaden the scope and increase the activity of the engineering societies' safety committees.*

How this may be done may need our combined viewpoint and experience. Certainly among the objectives of such committees should be to have more and more safeguards built into machines by those engaged in designing machinery. This will will have to be accompanied by an educational campaign for those shortsighted users of machines who prefer to gamble on not having to pay the excessive costs of accidents to men and machines rather than being willing to pay for such safeguards at the outset.

Collateral work with institutions now working on the human aspects of accidents is indicated. In this connection may I say with appropriate apologies that there may be need for missionary work among members of the engineering societies themselves. The fascination of engineering techniques, measurable quantities, and mathematical certainties may lead to an indifference to the extent of the human problem in safety. Persons, unfortunately, do not fall into convenient categories. Their problems are never settled. Solutions cannot be indexed to be pulled out at will. Thus your safety committees will have to be concerned with mechanics as generally understood *and* with the mechanics of personality.

8 *Emphasize safety in practical ways in all society programs and in those wider programs in which the societies participate.*

Joint meetings with student chapters, with safety committees of various societies, special safety sessions at society meetings, and joint society-faculty meetings will all be helpful. Special panels of representative speakers, arranged for such varied meetings are an excellent means whereby different points of view may be fused into a constructive viewpoint. Outstanding among such varied meetings should be those between the safety committees and technical-school faculties on achieving a mutually helpful program.

9 *Persuade members of the societies to study "safety" themselves and to urge it in all their connections.*

This is so obvious that its importance is apt to be overlooked. If the societies emphasize the mechanical side only and leave untouched these wider issues dealing with people and accidents the larger side of the problem will remain untouched. If we agree that the human side is important enough to learn, then study by all, including practicing engineers, is indicated. Also such study provides the best basis from which to recommend it. Pronouncements on the value of safety and safety education by trained engineers receive more attention than the statements of those less competent. Study therefore is a privilege of position and carries with it the right to recommend it.

10 *Support special studies, encourage scholarships, and stimulate investigations into ways in which safety can best be incorporated into engineering training and practice.*

Scholarship grants provide a convincing index of interest. Not alone can the societies themselves support fellowships, but they can persuade industries to support such grants for such of their personnel as would benefit from such training. These grants could be in two major fields. There could be grants for postgraduate work in technical schools of the nature recommended earlier in this paper. In fact it is only on the basis of such grants that this type of training could be supported since the number of persons taking it would be necessarily limited.

Secondly, support could be given to employed personnel to take available noncredit courses as a means of improvement. This latter plan has the special advantage of giving immediate returns in terms of usefulness both to the men trained and to those whom they may train in turn.

11 *Prepare a publication, having the following features, on behalf of the societies:*

(*a*) A statement of the societies' philosophy of safety, which would include evidence that the societies are really and intelligently back of the safety program, both in education and practice.

(*b*) An outline of the practical ways in which the technical schools and colleges may include safety, using such of the foregoing points as might be important, and others.

(*c*) An outline of the practical ways in which the societies can actually co-operate with the schools and colleges. Cite what practical services are available from the societies and where and how they can be obtained. In other words, set forth a well-based, well-considered program which will engage the interest of both the schools, on the one hand, and the engineers on the other.

Such a publication would be a very useful addition to the constructive influences at work in behalf of expanded safety education in the nation's technical schools and colleges.

It is my hope, naturally, that this paper may stimulate both thought and discussion and above all,—activity. Our aim is one. We, like you, consider safety a normal and indispensable part of every operation and not as something superimposed on society. In moving toward this objective we do not, should not walk alone. May I remind you that such national organizations as the National Safety Council, the National Conservation Bureau, the U. S. Department of Labor, The American Society of Safety Engineers, the Society for the Promotion of Engineering Education and the American Standards Association are working on the same problem. Let us join together and together help meet another present challenge, the challenge for a truly national approach to this national problem. I hardly need add that any service which the Center for Safety Education at New York University can render you, within the limits of its program, will be done gladly. All good wishes to you in perfecting those plans and programs which will lead to a safer and thus a happier America.

Employment Conditions for Engineers

(*Continued from page 809*)

whether the engineers wanted collective bargaining, but on what type they preferred. The vote was 15 for representation by a trade union, 23 by a company union, and 2150 by a professional engineers' group.

The Engineering Institute of Canada, on the other hand, asked whether its members preferred to be excluded from the provisions of the Dominion Order-in-Council or whether they wanted collective bargaining. Those who voted for the latter were asked to state what type they preferred. Unofficial reports of the voting indicate that only about 50 per cent of the members voted. Of these 92 per cent voted in favor of collective bargaining through professional engineers' groups if the present Order-in-Council respecting collective bargaining is not amended to exclude professional engineers.

In the survey of views on this matter conducted by the Corporation of Professional Engineers of Quebec, the vote in favor of collective bargaining was 563 to 311, there being 874 votes cast out of a possible 1481. As to the agency to represent engineers, the vote was overwhelmingly in favor of representation by professional engineers' groups.

At the last annual meeting of E.C.P.D., it was voted that this committee be requested to consider the propriety of presenting principles which might guide members of the constituent societies in their thinking with respect to unionism for engineers. Your committee is not in a position to report on this difficult matter as we have been unable to hold a meeting due to war conditions.

COMMENTS ON PAPERS

Including Letters From Readers on Miscellaneous Subjects

Fuels and Power-Plant Design

COMMENT BY E. G. BAILEY[1]

The fundamental thoughts included in this paper on fuel investigations,[2] are timely indeed although the author has possibly discussed the matter in such great detail that it will be necessary to condense and emphasize certain parts of it for the guidance of executives and planning engineers.

In certain areas of this country, it is a rather simple matter to determine the logical fuel for the future because the proximity of certain coal fields leaves but little choice. Farseeing engineers are planning for the worst coal that is likely to come from such areas, in order to have a reasonable factor of safety in operating their plants at expected capacity and efficiency, regardless of normal or even abnormal variations in quality of fuel.

Experiences of the past year will undoubtedly be accentuated during the next year in emphasizing the importance of having coal-burning plants designed with some factor of safety as to character of coal, quality of coal, and ash characteristics.

Where coal-burning plants are located to receive their normal coal supply from the Appalachian fields, this problem is of much greater importance, and outside of a very few owners and engineers, the problem is not being given all the attention it deserves. In recent conversation with an engineer who is planning a new power station and expecting to design it for his present source of fuel supply, the writer pointed out some factors which should be given consideration over a term of 30 years, the substance of the argument leading to consideration of other coals, as a possible future fuel. The thanks for the advice was in being considered as having the viewpoint of a coal man.

At the present time, there seems to be no recognized consultant who is in an authoritative position to advise on this subject. This situation again illustrates the overspecialization of our educational and industrial systems in that we are not properly training individuals to view engineering and economic problems from a broad perspective. This particular problem requires some knowledge of geology, mining conditions, basic mining costs, chemistry and combustion, railroad-rate structures as they are and as they should be, together with statistical trends in production interpreted into the future.

The power-plant builders of today and tomorrow, who are aware of the need of obtaining this information, may have to consult half a dozen specialists, and coordinate the resulting data themselves. Someday, they will thank those who helped them to get the best answer.

Those who neglect to look that far ahead have only now to look around and see the results and worries of those purchasing agents and engineers who failed to give this question proper consideration when their plants were built, and for which they are trying to find suitable fuel.

COMMENT BY F. L. DONAHER[3]

Until recently, fuel investigation has not been seriously considered in the design of power plants, and especially for fuel-burning equipment and furnaces. In many cases, the chief consideration has been an effort to purchase as much grate area, furnace volume, water-cooled surfaces, and heating surface per dollar as possible. At times this has been responsible for building up competition and pricecutting between competitive manufacturers. These maneuvers, of course, have resulted in many problems for the operating engineer and his staff, not to mention the loss in dollars in fuel economy and maintenance.

The author has comprehensively discussed the various elements of a fuel investigation which should be conducted for every plant before it is laid out on the drawing board.

The larger and moderately sized industrial plants even today are reluctant to devote the time and effort necessary to investigate available fuel before considering the fuel-burning and steam-generating equipment to be purchased. They lose sight of the fact that steam-production costs are an important percentage of their total production costs.

In our work we have found continually plant engineers, purchasing departments, and consulting engineers who have limited their source of supply acutely by cutting corners on furnace and boiler design. A few more hundred square feet of water-cooling surface very often could save thousands of dollars in annual coal bills. Stoker and pulverizer design should accommodate a wide range of coals, and very often narrow limits are set in coal selection by poor design.

At the present time, because of emergency conditions, coal has been diverted from some stations to war production, by-product, and Army and Navy uses. This, together with the labor situation at the mines, has caused definite shortages of regular coal sources of supply. In some sections of the country many plants are using and trying, with varying degrees of success, to use coal of inferior quality, i.e. inferior as compared to their customary source of supply.

In some cases the inferior coal can produce sufficient steam to satisfy only about 50 per cent of the normal steam demand. The question now arises: "Should these boiler units have been designed to take care of the inferior type of coal now available?"

The present condition of coal supply should not exist longer than 2 or 3 years more, we hope, after which time the normal sources of supply will return to their regular markets. For this reason, it is logical to say that it is not advisable to design boiler units for the inferior coals now supplanting the normal coals, unless these inferior coals can be marketed on a competitive thermal basis. Many of the mines now producing inferior grades of coal have suddenly sprung into existence to take advantage of the market conditions today, but in normal times their operating costs will prohibit competition with the larger, lower-cost mines producing better coal.

Most of the high-grade bituminous coals originate in District No. 7 and District No. 8. District No. 7 includes mostly low-volatile coals. It is true that some of the mines in this district are being worked out; however, there are numerous properties and seams in this district which have not yet been operated to any great extent. The prospect for this district is that low-volatile coal will be available for many years. Some of the newer seams mined are thin, re-

[1] Chairman, Bailey Meter Company, Cleveland, Ohio. Vice-President, The Babcock & Wilcox Company, New York, N. Y. Fellow A.S.M.E.

[2] "Fuel Investigation Should Precede Power-Plant Design," by E. C. Payne, MECHANICAL ENGINEERING, August, 1944, pp. 519–522.

[3] District Manager, Coal Bureau, Norfolk & Western Railway Co., Detroit 26, Mich. Mem. A.S.M.E.

quiring in some cases mechanized operation, but the quality of the coal is good with perhaps a slight increase in volatile content. For industrial steam-plant use, however, the slight changes in the chemical characteristics of these coals will not affect seriously the operation of industrial boiler plants.

District No. 8 produces high-volatile coals predominantly, and although some mines are being worked out, new operations and new fields are being developed. In general, this district is in good condition for a long life.

For many years, we can be assured of high-grade bituminous coals, but fuel investigation should be a very powerful means to conserve our nation's coal resources even though they are estimated to last for 3800 years to come.

The more each boiler-plant designer can learn about the physical, chemical, and burning characteristics of coals available as sources of supply, the more economical will be the results obtained by his boiler plant, and operating and maintenance costs will be at a minimum. Studies of mining conditions, operating conditions of the mines, mine ratings, expected life of mines, etc., should be helpful to the designer in producing an economical and complete boiler room job. An occasional trip to the coal fields would be helpful to the boiler plant designer to get acquainted with the actual mining operations and to acquire first-hand information of mines and what and how they produce.

Coal producers and shippers should make available, both to designer and purchaser, current analyses and data relative to supply, conditions of operation, and any other helpful information which would assist the engineer or purchaser in designing the boiler plant, and to help operate the plant at the lowest net steam cost.

To those who have operated steam plants, it is evident how helpful all these data are and how important fuel investigation is in fuel selection and fuel evaluation. It should be helpful in the same degree to the designer of boiler plants.

COMMENT BY M. F. FREEMAN[4]

The paper calls attention to facts which have been emphasized by the war needs for various fuels and particularly for liquid fuels. The demands have also required the use of large amounts of solid fuel by utilities and industry. The paper deals fundamentally with coal as a fuel since tremendous quantities of bituminous coal are available in the future far outweighing known quantities of any other fuel for combustion in power plants.

[4] Mechanical Engineer, Stone & Webster Engineering Corp., Boston, Mass. Mem. A.S.M.E.

The author also points out that some mines, producing high-fusion low-volatile coals, will be exhausted in the not too far distant future, while the large reserves available are low-fusion high-volatile coals. Because of this developing condition, he feels power plants should be designed to use more than one coal efficiently. We have no issue with the paper but agree heartily on this as a proper basis for the design of combustion equipment in a power plant.

High-capacity combustion equipment usually justifies a design for pulverized fuel with heat-recovery equipment, such as economizers and air heaters. Such an installation can be designed to utilize a wide range of solid fuels as well as oil and gas. This arrangement should be the ideal from a purchasing agent's point of view, as fuel could often be bought on a Btu basis with a small proviso on grindability. A comparative operating cost on coals of different grindability could be set up. The efficiency of such a unit should be quite uniform for any particular group of coals and with very little variation for a great many coals.

To some extent, the same comments may be applied to stoker-fired units. It usually is not difficult to design combustion equipment to handle economically the fuel available to a certain area. We now have spreader-stoker equipment which apparently can handle a very wide range of coals satisfactorily. Efficiency of a boiler without heat-recovery equipment would vary some, but then only in small amounts due largely to variations in hydrogen loss.

Other types of stokers can usually be arranged to permit the use of various fuels available at a given plant. It is possible that some plant locations will involve the availability of a large variety of coals. In these cases, the engineers will be required to set up relative values or operating costs for the use of the purchasing organization.

The author also advises that premium fuels are becoming less available for power plants. Special-process plants require certain types of fuel in many cases. Power plants located in certain areas, as in New England, would also prefer high-grade coal because a large percentage of cost is represented by transportation charges. Such conditions will, of course, place the onus of using lower-heating-value fuels on power plants which enjoy lower freight charges due to location.

The subject of the paper may well apply to all fuels, as the petroleum industry is making deeper cuts into crudes for producing products salable at high prices. Fuel oil fundamentally is the refuse of an oil refinery, and its quantity and value should be expected to decrease as the industry develops. Oil-burning plants may be forced to burn gas and, if far from gas areas, to burn solid fuel of some sort.

We normally develop a list of fuels practically available for any new plant to determine the type of combustion equipment required for the installation involved. We follow the practice described in the paper applying to engineering design quite thoroughly.

COMMENT BY J. E. TOBEY[5]

Of all the factors which enter into design or modernization of a power plant, fuel economics and fuel availability are undoubtedly the most important.

Paradoxically, these factors are most often neglected or given but superficial consideration. The fuel factor should be given such consideration, and it most certainly should involve long-range planning, as the author has so well stated.

Steam plants are generally long-lived, and those responsible for their design and construction should think of fuel supply for a span of 25 or 30 years. It is a serious business, requiring the highest degree of understanding of fuel economics, to design a new plant or to modernize an old plant.

There are literally thousands of plants in distress in America today which offer irrefutable evidence of poor planning and a lack of over-all knowledge of bituminous coal. During the war emergency, these handicapped plants are actually taking a toll in the form of loss of production in critical war materials; they require expediencies disruptive to coal distribution and are driving their owners and operators to distraction.

During normal times, these same plants are uneconomical and cannot purchase the best fuel values the market affords.

If a steam plant can use only one specific type of coal, say, of metallurgical quality, there is in many instances something wrong in its design.

Today requests are being made by the government on some plants which can only burn coal of metallurgical quality to change from those coals, while on the other hand, many plants which can burn a wide range of coals are not required to change because they are already burning the less critical coals.

Basically, steam generation is not a critical process, for steam can be generated from sawdust or any raw material containing hydrocarbons. It is only poor planning or poor engineering which makes the process difficult.

It is rather difficult to see why more engineers have not become proficient in this field. It is definitely a part of the mechanical engineer's function. Not many industrial consumers and engineers are available who are well-grounded in

[5] Director, Fairmont Coal Bureau, Upper Monongahela Valley Association, Fairmont, West Va.

practical fuel economies and who relate power-plant design to present and future coal reserves.

It is not at all uncommon to read engineering papers describing the design features and operating experiences of new steam plants with little or no mention of fuel. It is apparent that too many designs omit or give too little attention to the first and most vital step; the fuel investigation.

The following suggestions are made in the interest of better coal utilization:

1 Make a thorough study of coal reserves by seams.

2 Learn the standard industrial sizes produced in each field.

3 Study mining methods and preparation equipment used in various fields.

4 Know something regarding basic mining costs in different fields.

5 Study delivered cost relationships compensated by Btu values.

6 Determine which coals are likely to be available for 30 years.

7 Make absolutely sure that plant design conforms with the findings of the fuel investigation.

8 Spend additional money to secure proper plant design, if necessary, for this additional cost will be returned many times over.

In conclusion, it is hoped that the new note which the author has sounded will be given serious consideration, for if it is, a great many difficulties in the use of coal will be overcome.

It should be remembered that a boiler is a heat exchanger, but the fuel-burning elements, furnace, stoker, or pulverizer, are the prime elements which liberate the energy from the fuel. More emphasis is needed in the co-ordinated design of these elements to obtain over-all satisfaction and economy in the use of coals.

Stepped Extrusions

COMMENT BY SAM TOUR[6]

This paper[7] represents a step in advance in the art of extruding of metals and the author of the paper is to be congratulated on his accomplishment.

Fig. 3 shows the presence at the step of what might be considered as "dead metal." By a redesign of the extrusion die, it might be possible to eliminate this dead-metal pocket and at the same time reduce the amount of machining necessary on the finished item to remove this layer of metal.

One of the difficulties in the practical application of this principle to the production of many items lies in the design of the extrusion machines available today. Limitations of space around the fixed plate of an extrusion machine are great. In the future it might be possible to design and build extrusion machines so that hydraulically operated dies may be installed and hydraulically adjusted during the progress of the extrusion so as to make multiple steps or almost continuous taper extrusions. This requires a major but not an impossible change in extrusion-press design and construction.

AUTHOR'S CLOSURE

The author is in complete sympathy with the suggestion which is made by Mr. Tour. Some very preliminary experimental work is being carried out in an effort to eliminate the "dead metal." However, there is no indication at the present time that this can be accomplished on the type of stepped extrusions which are being currently made.

KIRBY THORNTON.[8]

Who First Used "Enthalpy?"

TO THE EDITOR:

The purpose of this letter is to give a brief account of the introduction and the use of the term enthalpy. Being under the impression that J. E. Trevor had used enthalpy for the heat function the writer asked Prof. F. O. Ellenwood to see if this was true. To this, Professor Ellenwood replied, and I quote with his permission:

"In regard to the term enthalpy which you asked about, I am unable to state positively who was the first one to use this term. I know that Professor Trevor used it at Cornell University in an advanced course in thermodynamics about 1910, 1911, 1912, and 1913. He later discarded it because he felt that it was too likely to be confused with entropy. I think that Professor Trevor may have first heard the use of the term by the Dutch physicist, Kamerlingh Onnes."

A general discussion on "The Generation and Utilization of Cold" was held jointly by the Faraday Society and the British Cold Storage and Ice Association on Oct. 16, 1922, in London (Faraday Society, vol. 18, p. 140, 1922-1923). A. W. Porter, president of the Faraday Society, presided over the first session of the meeting. In his introductory remarks Mr. Porter said:

"The quantity $E + pv$ is what is usually known in England as total heat or heat content. I submit that these names are not satisfactory, because the quantity is not heat in general; and the presence here of a member of the Leyden Laboratory encourages me to press the claim of the name proposed by Kamerlingh Onnes, viz., enthalpy—a name which I have used for some years."

In 1925 Mollier adopted the term enthalpy and used it to designate the heat function (Neue Tabellen and Diagramme für Wasserdampf, second edition, 1925, p.7). A. Eucken (Müller-Pouillet's Lehrbuch der Physik, eleventh edition, vol. 3, part 1, 1926, p. 131) also states that Kamerlingh Onnes proposed the term enthalpy.

A definition of enthalpy appears on page 24 in Handbuch der Physik, vol. 19, 1926; and credit for the term is given to Kamerlingh Onnes in vol. 10, p. 209, of this series. In MECHANICAL ENGINEERING, vol. 56, 1934, p. 87, Keyes, Smith, and Gerry use the terms heat function or enthalpy in their paper "Steam Research."

H. N. Davis was authorized at the A.S.M.E. Steam Tables Research Session (MECHANICAL ENGINEERING, vol. 58, 1936, p. 532) in December, 1934, to appoint a committee to select a suitable term for the heat function commonly referred to as total heat or heat content. A committee was appointed on Jan. 4, 1935, with F. O. Ellenwood as chairman, to select an appropriate name for the "heat function." The Executive Committee of the Council of the A.S.M.E. on May 21, 1936, voted to adopt the report of this committee to use enthalpy for the thermodynamic function defined as the internal energy plus the pressure-volume product of any working substance.

Finally, enthalpy is defined by Weld (Glossary of Physics, p. 71, 1937) and is now extensively used by physicists, chemists, and heat power engineers in America and Europe. It would be of interest to know if and when Kamerlingh Onnes first used the term enthalpy.

E. B. PENROD.[9]

Correction to 1942 Paper

TO THE EDITOR:

I should like to make a correction in the paper entitled, "The Effect of Diametral Clearance on the Load Capacity of a Journal Bearing," which I presented at the Annual Meeting of the Society, December 1 to 5, 1941, and which was published in the Transactions of the A.S.M.E. for 1942. On the second page of the paper in the sixth paragraph of the right-hand column it is stated that the radius of the bearing used in calculating the curves in figures one to five is two and one-sixteenths inches. This is in error and should be corrected to read: "The radius of the bearing is one and one-sixteenths inches, and its axial length one and eight-hundredths inches." The curves and the rest of the paper appear to be correct.

JOHN T. BURWELL, JR.[10]

[6] Sam Tour & Co., Inc., New York 6, N. Y.

[7] "Stepped Extrusions," by K. F. Thornton, MECHANICAL ENGINEERING, July, 1944, pp. 443-446.

[8] Aircraft Service Engineer, Aluminum Company of America, New Kensington, Pa.

[9] Armour Research Foundation, Chicago 16, Ill.

[10] Lieutenant, U.S.N.R., Washington, D. C.

A.S.M.E. BOILER CODE

Interpretations

THE Boiler Code Committee meets monthly for the purpose of considering communications relative to the Boiler Code. Anyone desiring information on the application of the Code may communicate with the Committee Secretary, 29 West 39th St., New York 18, N. Y.

The procedure of the Committee in handling the cases is as follows: All inquiries must be in written form before they are accepted for consideration. Copies are then sent by the Secretary of the Committee to all the members of the Committee. The interpretation, in the form of a reply, is then prepared by the Committee and is passed upon at a regular meeting.

This interpretation is later submitted to the Council of The American Society of Mechanical Engineers for approval and then is issued to the inquirer and published in MECHANICAL ENGINEERING.

Following is a record of the interpretations of this Committee formulated at the meeting of October 13, 1944, and approved by A.S.M.E. Council on November 15, 1944.

CASE No. 897 (REOPENED)

(Special Ruling)

Inquiry: May chrome-nickel steels as such, or alloyed with columbium, titanium, or molybdenum, be used in the construction of unfired pressure vessels under A.S.M.E. Code rules?

Reply: Chrome-nickel steels as such, or alloyed with columbium, titanium, or molybdenum, may be used in the construction of unfired pressure vessels under the Code without consideration for their corrosive properties, with the following limitations:

(1) (This item is unchanged from present wording.)

(2) *Specifications.* The alloy chrome-nickel material shall conform to Specification SA-240, Grades S, M, C, or T, for sheets and plates; to Specification SA-213, austenitic grades T8(S), T18(T), T19(C), or T20(M), for seamless tubes; to Specification SA-249, Grades T8(S), T18(T), T19(C), or T24(M) for welded tubes, except that the carbon content shall not exceed 0.08 per cent for welded tubes, except as modified in (2*a*). Structural shapes, bars, pipes, and forgings made to the same specifications, so far as applicable, may be used. The chemical requirements of Specification SA-240 may be substituted for the chemical requirements either in Specifications SA-213 or SA-249.

(*a*) (This section remains unchanged from present wording, except that item (I) is deleted. In new item (I) (old item II), in the last sentence change "presents" to "increases.")

(*b*) *Marking.* (This section remains unchanged from present wording.)

(*c*) (This section remains unchanged from present wording.)

(3) (This item remains unchanged from present wording.)

(4) (This item remains unchanged from present wording.)

(5) *Pressure Limitations.* Pounds per square inch:

Class	S	M	C	T
U-68	...	...	...	...
U-69	600	600	600	600
U-70	100	100	100	100

(6) *Temperature Limitations.* Degrees Fahrenheit:

Class	S	M
U-68	−320 to 600	−320 to 600
U-69	−320 to 600	−320 to 600
U-70	− 20 to 250	− 20 to 250
	C	**T**
U-68	−320 to 1200	−320 to 1200
U-69	−320 to 600	−320 to 600
U-70	− 20 to 250	− 20 to 250

When materials are used at temperatures below —20F, the impact tests provided in Par. U-142 shall be met. In the case of Par. U-69 vessels, the test plates from which the impact test bars are taken shall be prepared as prescribed in Par. U-68.

These materials may be used at temperatures below —20F provided the requirements of Par. U-142 are complied with. The allowable stress shall be the same as that given for —20 F to 600 F.

For operating temperatures above 600 F, Classes C and T should preferably be given the heat-treatment specified in (3*b*).

(7) *Allowable Working Stresses.* For Pars. U-68 and U-69 vessels the allowable working stresses shall be those given in Table U-2 and when the operating temperature is less than —20F, the allowable working stress shall be that given in the table for —20 F to 650 F.

For Par. U-70 vessels the maximum allowable working stresses for steel complying with Specification SA-240 shall be 25 per cent greater than those given in Par. U-70(*a*) and (*b*).

(8) *Welding.* (This item remains unchanged from the present wording.)

(9) *Seamless Forgings.* Seamless forgings of the composition and mechanical properties specified in (2*a*) and marked as in (2*b*), and made to the general requirements of Specification SA-266, except that the steel making process shall conform to Specification SA-240 when heat-treated in accordance with (3) may be used within the limitations given for Par. U-68 construction in (4), (5), and (6). A bend test tube specimen for the check test of heat-treatment shall be provided as a duplicate of the bend-test specimen required by Specification SA-266 and shall be heat-treated with the vessel.

CASE No. 924 (*Annulled*)

CASE No. 989 (REOPENED)

(Special Ruling)

Inquiry: May chromium steels be used in the construction of welded unfired pressure vessels under the A.S.M.E. Code rules?

Reply: Chromium steels may be used in the construction of welded unfired pressure vessels in accordance with the rules of Par. U-68 of the Code with the following limitations:

(1) *Material Specifications.* Material shall conform to one of the following specifications:

Item	Spec. number	Grade or class	A.I.S.I. type no.
Sheets and plates	SA-240	A	410 modified
Sheets and plates	SA-240	B	....
Sheets and plates	SA-240	D	430 modified
Forgings	SA-182	F6	410
Forgings	SA-182	[b]	[b]
Pipe	SA-158	P6[a]	410
Castings	A.S.T.M. A 221–39	A	410

[a] Tungsten to be omitted.

[b] The material shall conform with Specification SA-182 in so far as applicable, except the chemical requirements shall comply with those specified for sheets and plates, Grade D, type 430 modified.

(2) (This item remains unchanged from the present wording.)

(3) (This item remains unchanged from the present wording.)

(4) (This item remains unchanged from the present wording, revising "for Grade 2 of A.S.T.M. A 176–41 (S-61)" to read: "for Grade A of Specification SA-240").

(5) (This item remains unchanged from the present wording.)

CASE No. 1014

(In the hands of the Committee)

CASE No. 1015 (*Special Ruling*)

Inquiry: May high-tensile strength manganese steel plate, now in stock, having the chemical analysis indicated below, be used in the construction of fusion-welded unfired pressure vessels:

Carbon, max, per cent.....	0.31
Manganese, per cent.....	0.80 to 1.20
Phosphorus, max, per cent..	0.040
Sulphur, max, per cent....	0.050
Silicon, min, per cent.....0.12	

Reply: It is the opinion of the Committee that steel plate with the chemical analysis given in the inquiry may be used provided:

(1) A tension test specimen is taken from each individual plate and the ultimate tensile strength comes within a tensile range of 75,000 and 87,000 psi;

(2) A cold bend test specimen is taken from each individual plate and complies with the requirements in Specification SA-212 for Grade B material;

(3) A welding procedure for this plate material is established in compliance with the requirements of Section IX of the Code.

Plate material complying with the above requirements may be considered as meeting Specification SA-212, Grade B, modified, and the specified minimum tensile strength of that specification (70,0000 psi) shall be stamped on each plate if it is to be used in a Code vessel.

CASE No. 1016

(Interpretation of Par. U-41)

Inquiry: Par. U-41(*b*) (6) is not clear as to what values of *C* shall be used when the details for welded staybolts of Fig. U-6 are used; and Par. U-41(*c*) does not specify the values of *C* when the details of Fig. U-7 are used. What values of *C* shall be used in the formula of Par. U-40(*a*) for determining the maximum allowable working pressure for stayed plate surfaces when the details of the above-mentioned figures are used?

Reply: It is the opinion of the Committee that the following values of the constant *C* may be used:

(1) For the details shown in Figs. U-6(*a*), (*b*), and (*c*):
C = 112 for plates under $^7/_{16}$ in. thick;
C = 120 for plates $^7/_{16}$ in. thick and over.

(2) For the details shown in Fig. U-6(*c*) and (*d*):
C = 135 for all plate thicknesses.

(3) For the details shown in Fig. U-7:
C = 112 if either plate is less than $^7/_{16}$ in. thick;
C = 120 if both plates are $^7/_{16}$ in. thick or over.

Proposed Revisions and Addenda to Boiler Construction Code

IT IS the policy of the Boiler Code Committee to receive and consider as promptly as possible any desired revisions of the rules and its codes. Any suggestions for revisions or modifications that are approved by the Committee will be recommended for addenda to the code, to be included later in the proper place.

The following proposed revisions have been approved for publication as proposed addenda to the code. They are published below with the corresponding paragraph number to identify their location in the various sections of the code and are submitted for criticism and approval from anyone interested therein.

It is to be noted that a proposed revision of the code should not be considered final until formally adopted by the Council of the Society and issued as pink-colored addenda sheets. Added words are printed in SMALL CAPITALS; words to be deleted are enclosed in brackets [ ]. Communications should be addressed to the Secretary of the Boiler Code Committee, 29 West 39th St., New York 18, N. Y., in order that they may be presented to the Committee for consideration.

PARS. P-102(*b*) (12*a*) and U-68(*b*) (12*a*). Revise as follows:

(*a*) Welds in which the radiographs show elongated slag inclusions or cavities [exceeding the permissible limits or lack of fusion] shall be unacceptable if the length of any such imperfection is greater than $^1/_3T$, where *T* is the thickness of the THINNER PLATE weld. If SEVERAL [the lengths of such] imperfections WITHIN THE ABOVE LIMITATIONS EXIST IN LINE [are less than $^1/_2$T], the welds shall be judged acceptable, if the sum of the LONGEST DIMENSIONS [length] of all such imperfections is not more than *T* in a length of 12*T* and IF THE DEFECTS are separated by at least 6*L* of acceptable weld metal, where *L* is the length of the longest imperfection. THE MAXIMUM LENGTH OF ACCEPTABLE INCLUSION FOR ANY PLATE THICKNESS SHALL BE $^3/_4$ IN. ANY SLAG INCLUSION SHORTER THAN $^1/_4$ IN. SHALL BE ACCEPTABLE FOR ANY PLATE THICKNESS.

PAR. P-332. Revise as follows:

Change the title of (*c*) to read: "Code Symbol Stamps."

Change the second section of (*c*) to read:

Permission to use the symbol STAMPS shown IN FIGS. P-41, P-47, AND P-47$^1/_2$ (this will be a replica of the assembly stamp) [designated in the foregoing paragraph] will be granted by The American Society of Mechanical Engineers TO any ORGANIZATION OR INDIVIDUAL manufacturer [complying with the provisions of this Code] who will agree, upon forms issued by the Society, that any part to which A [the] CODE symbol STAMP IS TO BE applied will be constructed in full accordance with the Code requirements and that he will not misuse or allow others to use the stamp by which the symbol is applied.

Add to the first section of (*d*) the words: "See also (*b*)."

Add the following as (*b*):

(*b*) The assembly of a boiler unit may be made by any one possessing a power boiler stamp, or an assembly stamp shown in Fig. P-47$^1/_2$. When the assembly is made by anyone other than the manufacturer of the boiler unit, all data report sheets properly executed in accordance with this paragraph shall be forwarded to the assembler who shall be responsible for the proper handling of the data reports.

Data report sheets properly executed in accordance with this paragraph shall be forwarded by each of the several manufacturers of the part to the owner or contractor for the parts, or to the organization making the assembly. The assembly organization shall be responsible for the proper handling of the data reports.

If there are more than one such data sheets, the assembler shall make out a master data sheet to which shall be attached those from the several manufacturers. In item (1) of the master sheet, the word "assembler" shall be substituted for "manufacturer."

The assembler shall fill in such items as are not covered by the other data sheets and sign the master data sheet as the "assembler" or "assembling organization" instead of "manufacturer." He shall also append, above his signature, the statement: "We certify that the field assembly of all parts conforms with the requirements of the A.S.M.E. Boiler Construction Code."

The assembler's stamp, together with the name of the assembler or an acceptable abbreviation, shall be applied in the field on the boiler near the stamping called for by (*c*) of this paragraph, when authorized by the field inspector, after the hydrostatic test. This stamping shall also be reproduced on a name plate as provided for in (*c*).

The Certificate of Field Inspection on the master data sheet shall be executed by the authorized inspector after the hydrostatic test and final inspection.

The assembler or assembling organization shall forward the data reports to the required number of the proper authorities.

PAR. P-334. In the second line, change "symbol" to "symbols."

SPECIFICATIONS SA-83. Revise note preceding Par. 1 as follows:

NOTE: Tubes for unfired pressure vessels complying with A.S.T.M. Specifications A 179–42, ordered to minimum wall thickness, will be acceptable as complying with the intent of Specification SA-83.

PAR. U-41(*b*) (6). Revise as follows:

(6) The provisions of Par. U-40 are followed using the FOLLOWING VALUES OF THE constant (C) [for threaded staybolts]:

C = 112 FOR PLATES UNDER $^7/_{16}$ IN. THICK, FOR THE DETAIL SHOWN IN FIG. U-6(*a*), (*b*), AND (*c*);

C = 120 FOR PLATES $^7/_{16}$ IN. THICK AND OVER, FOR THE DETAIL SHOWN IN FIG. U-6(*a*), (*b*) AND (*c*);

C = 135 FOR DETAILS SHOWN IN FIG. U-6(*c*) AND (*d*).

PAR. U-41(*c*). Add the following as item (8):

(8) THE MAXIMUM SPACING OF STAYS IS DETERMINED BY THE FORMULA IN PAR. U-40(*a*), USING:

C = 112 IF EITHER PLATE IS UNDER $^7/_{16}$ IN., THICK,

C = 120 IF BOTH PLATES ARE $^7/_{16}$ IN. THICK, OR OVER.

REVIEWS OF BOOKS

And Notes on Books Received in the Engineering Societies Library

Helicopter Design

NOTES ON HELICOPTER DESIGN THEORY. By Alexander A. Nikolsky. Princeton University Press, paper, 296 pp., $3.

REVIEWED BY ALEXANDER KLEMIN[1]

THE technical literature of the helicopter is meager and this addition to it is very welcome. Professor Nikolsky is at pains to point out that since a large part of the available theory in this field is still in an unstable state, the notes should not be used for design and calculation purposes without some reservation, and that they do not constitute a textbook. But they do constitute a scholarly and thoughtful presentation of the subject and an excellent introduction to the reading of the experimental and theoretical reports on the helicopter which will be at our disposal sooner or later. The author has also made excellent use of the best material that has appeared so far—Durand on fundamental aerodynamic and airscrew theory, Bennett's writings in *Aircraft Engineering*, Wheatley's N.A.C.A. reports, etc., and reference to the most important publications is complete and satisfactory.

Professor Nikolsky begins with a concise review of airscrew theory and continues with an excellent statement of the theory of the helicopter in vertical flight. The chapter entitled "Introduction to Flapping and Feathering" clears up the fundamentals of the various hinges. Forward motion and applied loads on blades are treated soundly though with perhaps greater mathematical complexity than the actual bases of the subject permit. Performance calculations are treated briefly. Static stability is also discussed. Altogether these notes will prove useful to a great many people, and Professor Nikolsky can be complimented on his courage in approaching a difficult and rapidly developing subject, without waiting to write a definitive book since definitive books on technology have a way of appearing when their sole interest is for students.

[1] Guggenheim Research Professor, New York University, Greenwich, Conn. Mem. A.S.M.E.

Climate and the Energy of Nations

CLIMATE AND THE ENERGY OF NATIONS, by S. F. Markham. Oxford University Press, New York, N. Y., 1944. Cloth, 5¼ in. × 8⅜ in., 236 pp., illus., $3.50.

REVIEWED BY LAUREN E. SEELEY[2]

THERE *must* have been a Garden of Eden when man was created. Otherwise it is difficult to see how a naked, hairless, thin-skinned, warm-blooded creature could have survived. Man's migration over all the earth, the seas, and in the air represents, among other things, a triumph over his thermal environment. Clothing, shelter, diet, and the mastery of fire are the means by which man has achieved survival.

Mere survival, however, is not the theme of this book. It seeks for those things that permit men to reach a peak of energy, productivity, and well-being. Studies of the rise and fall of civilizations, the climates of the world, man's relation to his thermal environment, and selected statistics were used to guide the author to the conclusion that certain natural climates combinated with "climate control"—viz., the application of heating, ventilation, and air conditioning—provided the best conditions to call forth the full power of mankind. In the author's own words, ". . . . . I am convinced that one of the basic reasons for the rise of a nation in modern times is its control over climatic conditions;" one sees the art of "climate control" being invested with political and sociological significance.

To the engineer "climate control" is a practice—not a theory. The author leads him to familiar ground but by routes that may be ingenious and doors that may be new. When the author says, "It is perhaps more than a coincidence that the rise of Greece and Rome should follow the advent of heating systems and that the fall of the Roman Empire should follow their abandonment," the implications will surely produce mingled reactions from historians, sociologists, politicians, engineers, and others.

These mingled reactions suggest that no one reviewer could or should pass upon the author's thesis. Each reader must form his own opinions. The author's attempt at the aggrandizement of "climate control" cannot altogether succeed. The potential controversy within the book may seem to the engineer as something unnecessary to the assured future of "climate control" itself.

The book does contain an interesting combination of facts—a combination that would be new to most readers. It also is constructive in emphasizing the necessity of "climate control" in addition to a good natural climate. Geographers often appear to study climate and its relation to mankind on the assumption that man is an outdoor creature. Modern civilization is driving people indoors more and more. A suitable climate should follow them.

[2] Assistant professor, School of Engineering, Yale University, New Haven, Conn. Mem. A.S.M.E.

Books Received in Library

AIRCRAFT SHEET METAL BLUEPRINT READING. By H. H. Coxen, G. E. Jackson, and G. D. Masters. American Technical Society, Chicago, Ill., 1933. Stiff paper, 8½ × 11 in., 132 pp., illus., diagrams, charts, tables, blueprints, $2.50. The material in this workbook is devoted solely to instruction in the actual reading of blueprints without introducing a background of mechanical-drawing practice. Beginning with the most elementary aspects it develops the subject to the point of interpreting fairly complicated drawings mainly in question and answer form. Common forms and abbreviations are defined for the beginner.

A.S.T.M. STANDARDS ON COAL AND COKE. Prepared by A.S.T.M. Committee D-5 on Coal and Coke. American Society for Testing Materials, Philadelphia, Pa., September, 1944. Paper, 6 × 9 in., 124 pp., illus., diagrams, charts, tables, $1.50. This pamphlet brings together conveniently the Association's current directions for sampling, analyzing, and testing coal and coke.

BASIC STRUCTURES. By F. R. Shanley. John Wiley & Sons, Inc., New York, N. Y.; Chapman & Hall, London, England, 1944. Cloth, 5½ × 8¼ in., 392 pp., illus., diagrams, charts, tables, $4.50. The beginning chapters describe simple kinds of forces and force systems and develop the methods of transmitting these forces through space. From this point on, the arrangement has been dictated by the actual development and analysis of the structure as a means of force transmission with particular emphasis on the physical action involved. The mathematical treatment has been kept as simple as possible.

Special application is made to the design and analysis of aircraft structures.

CHEMICAL ENGINEERING THERMODYNAMICS (Chemical Engineering Series). By B. F. Dodge. McGraw-Hill Book Co., Inc., New York, N. Y., and London, England, 1944. Cloth, $5^1/_2 \times 9$ in., 680 pp., diagrams, charts, tables, $6. After a thorough treatment of the fundamental laws, this book develops various applications of particular interest to chemical engineers. The following applications have been selected for detailed treatment: thermodynamic properties of fluids, expansion and compression of gases, fluid flow, heat transfer, refrigeration, chemical reaction, equilibria, and distillation equilibria and processes. A working knowledge of elementary physics, physical chemistry, and mathematics through calculus is assumed.

THE CONTROL OF GERMANY AND JAPAN. By H. G. Moulton and L. Marlio. Brookings Institution, Washington, D. C., 1944. Cloth, $6 \times 9^1/_4$ in., 116 pp., tables, maps, $2. This new publication of the Brookings Institution is concerned with the problem of preventing future military aggression by Germany and Japan. The possibilities of their control by various economic measures, such as restriction of the importation of raw materials and the control of key industries are discussed, and the disadvantages of various plans are noted. A military control plan is described which offers possibilities and which the authors believe to be the only effective means of checking aggression.

CONVEYORS AND RELATED EQUIPMENT. By W. G. Hudson. John Wiley & Sons, Inc., New York, N. Y.; Chapman & Hall, London, England, 1944. Cloth, $5^1/_2 \times 8^1/_2$ in., 341 pp., illus., diagrams, charts, tables, $5. The title hardly describes this book, for it is a description of materials-handling equipment of the present day, together with information on methods of storage and transport, and on crushing and screening equipment, car and ship unloading, weighing, and coal handling. The applications and limitations of various types of equipment are discussed. Information as to capacities, costs, etc., is included, with descriptions of layouts. While not comprehensive the book includes the equipment most frequently used.

GRÖSSE MASSZAHL UND EINHEIT. By M. Landolt. Rascher & Cie Verlag, Zürich, Switzerland, 1943. Paper, $5^1/_4 \times 8$ in., 85 pp., tables, 5.80 fr. This small book deals with the methods of handling quantities, such as lengths expressed in meters, output expressed in horsepower, etc., in various calculations, as distinguished from calculations using pure numbers only.

MAN'S FIGHT TO FLY, Famous World-Record Flights and a Chronology of Aviation. By J. P. V. Heinmuller, foreword by E. Rickenbacker. Funk & Wagnall Co., New York, N. Y., and London, England, 1944. Fabrikoid, 8×11 in., 366 pp., illus., charts, maps, tables, $6. The author of this book has for many years been observer and chief timer for the National Aeronautic Association, in which capacity he has timed most of the transatlantic and round-the-world flights. He has known nearly all the prominent fliers. His book gives his personal recollections of many world-record flights, illustrated by photographs from his collection. A chronology of aviation from 1483 to 1939 points the outstanding steps in development. An interesting popular book.

MECHANICAL SPRINGS. By A. M. Wahl. Penton Publishing Co., Cleveland, Ohio, 1944. Cloth, $6 \times 9^1/_4$ in., 435 pp., illus., diagrams, charts, tables, $6. The fundamental principles that underlie the design of mechanical springs are presented, together with the more important developments in spring theory and testing that have occurred in recent years. Special attention is given to helical springs, to the calculation of their stresses and to their fatigue properties. Other springs discussed include disk, flat, leaf, torsion, spiral, volute and ring springs, and rubber springs and mountings.

MEN OF SCIENCE IN AMERICA, the Role of Science in the Growth of Our Country. By B. Jaffe. Simon & Schuster, New York, N. Y., 1944. Cloth, 6×9 in., 600 pp., illus., diagrams, charts, tables, $3.75. A broad picture of the growth of science in the United States is presented by means of a series of biographical sketches. The lives and achievements of nineteen of the foremost American scientists are viewed against their historical background, with emphasis on the influence of scientific discovery upon the social structure. The future of science in America is briefly suggested in the last chapter, and a full list of sources and reference material is included.

METHODS OF ADVANCED CALCULUS. By P. Franklin. McGraw-Hill Book Company, Inc., New York, N. Y., and London, England, 1944. Cloth, $5^1/_4 \times 8^1/_2$ in., 486 pp., diagrams, charts, tables, $4.50. This textbook is designed for students whose major field of interest is engineering, mathematics, or science, but it may also serve the practicing engineer or applied scientist as an introduction to the more formidable mathematical treatises. The two principal objectives of the book are: first, to refresh and improve the student's technique in applying elementary calculus; and second, to present those methods of advanced calculus most needed in applied mathematics.

MILITARY AND COMMERCIAL AIRCRAFT HYDRAULICS. By R. N. Greif. Pitman Publishing Corporation, New York, N. Y., and Chicago, Ill., 1944. Cloth, $5^1/_4 \times 8^1/_4$ in., 113 pp., illus., diagrams, tables, $2. This practical book describes in detail the basic units of hydraulic systems, beginning with elementary applications and working up to complete systems for aircraft purposes. Maintenance, inspection, trouble-shooting, and repair are covered in the later chapters, and a separate chapter is devoted to an explanation of hydraulic plumbing details. The book is intended both as a text and a reference manual for the practical mechanic.

Mitteilungen aus der Versuchsanstalt für Wasserbau an der Eidg. Techn. Hochschule in Zürich, Nr. 4. THEORETISCHE GRUNDLAGEN DER FLUSS- UND WILDBACHVERBAUUNGEN. By R. Müller. Verlag AG. Gebr., Leemann & Co., Zürich, Switzerland, 1943. Paper, 6×9 in., 193 pp., illus., diagrams, charts, tables, 12 Swiss fr. (7.20 rm.). This publication summarizes the results of the studies of the movement of detritus which have long had the attention of the hydraulic laboratory of the Zürich Technical High School. It presents the available knowledge of theoretical principles and shows how these may be applied practically in the regulation of rivers and torrents.

PLASTICS MOLDS, Design, Construction, Use. By G. B. Thayer. Second edition. American Industrial Publishers, Cleveland 6, Ohio, 1944. Cloth, $6 \times 9^1/_4$ in., 136 pp., illus., diagrams, $3.50. An experienced engineer here presents his ideas on the design and construction of molds. The various classes of molds used in compression and injection molding are described, and detailed description of various molds given. New material has been added to this edition, including contributions by several collaborators.

RIFLES AND MACHINE GUNS, a Modern Handbook of Infantry and Aircraft Arms. By M. M. Johnson. William Morrow and Co., New York, N. Y., 1944. Cloth, $6 \times 9^1/_2$ in., 390 pp., illus., diagrams, tables, $5. Modern small arms are analyzed from the practical viewpoint of use. The book describes all the important United States and foreign weapons of the period of World War II from the rifle and pistol to the aircraft machine gun, covering their development, operation, loading, firing, and disassembling, with data on their ammunition, stoppages, accuracy, and employment. Line drawings and photographs illustrate the text.

SAFE INSTALLATION AND USE OF ABRASIVE WHEELS. (Studies and Reports, Series F, Second Section (Safety), No. 9.) International Labour Office, Montreal, Canada, 1944. Paper, $6^1/_4 \times 9^1/_4$ in., 175 pp., illus., diagrams, charts, tables, $1. The six main chapters of this publication deal with the composition and manufacture of abrasive wheels, accidents and injuries, safety precautions against bursting wheels, precautions against other types of accidents, prevention of dust inhalation, and a summary of the main precautions. Two analytical research reports on stresses in rotating disks are appended. Safety regulations in Germany, Great Britain, and the United States are given, including the 1943 revision of the "American Standard Safety Code . . . . . on Abrasive Wheels."

SCIENCE OF CLOCKS AND WATCHES. By A. L. Rawlings. Pitman Publishing Corporation, New York, N. Y., and Chicago, Ill., 1944. Cloth, $6 \times 9^1/_4$ in., 236 pp., diagrams, charts, maps, tables, $3.50. The author of this interesting book is well known for his work on compasses and especially for his book, "The Theory of the Gyro Compass." He here applies standard methods of scientific analyses to timepieces, which have long been of interest to him. The science of horology is presented in a fresh, unhackneyed way, with enough descriptive matter to make the book complete. The author's conclusions sometimes are contrary to present practice, and suggestions for improvement are frequent.

SELECTED PAPERS OF WILLIAM FREDERICK DURAND, reprinted in Commemoration of the Eighty-fifth Anniversary of his birth. The Durand Reprinting Committee, California Institute of Technology, Pasadena, Calif., 1944. Fabricoid, $8^1/_2 \times 11$ in., paged in sections, $2.50. Seventeen selected papers of William F. Durand, from 1896 to 1940, have been reprinted in commemoration of the eighty-fifth anniversary of his birth. The subject matter is varied, ranging from aerodynamics to philosophical considerations of science and engineering. A brief biographical sketch precedes the papers, and a bibliography of published works concludes the book.

Library Services

ENGINEERING Societies Library books may be borrowed by mail by A.S.M.E. members for a small handling charge. The Library also prepares bibliographies, maintains search and photostat services, and can provide microfilm copies of any item in its collection. Address inquiries to Harrison W. Craver, Director, Engineering Societies Library, 29 West 39th St., New York, N. Y.

A.S.M.E. NEWS

And Notes on Other Engineereng Societies

A.S.M.E.-A.I.M.E. Hold Joint Fuels Conference

Attracts 276 Engineers at Charleston, W. Va., October 30 and 31

WITH a total registration of 276, the A.S.M.E.-A.I.M.E. Joint Fuels Conference was held at the Daniel Boone hotel, Charleston, W. Va., October 30 and 31.

High Lights of Conference

Among the high lights of the two-day conference were the presentation of the Percy Nicholls Award "for notable scientific or industrial achievement in the field of solid fuels," to J. B. Morrow, president of the Pittsburgh Coal Company; the luncheon address by P. G. Lazzell; and the banquet at which Sidney H. Haughton, director, Geological Survey, and chairman, Fuel Research Board, Union of South Africa, spoke on fuel in South Africa, past, present, and future.

The Conference was held under the joint auspices of the Fuels Division of The American Society of Mechanical Engineers, the Coal Division of the American Institute of Mining and Metallurgical Engineers, the A.S.M.E. West Virginia Section, and the A.I.M.E. Central Appalachian Section.

E. G. Bailey Represents A.S.M.E. President

On the opening day of the Conference, C. C. Dickinson, president, Dickinson Coal Company, presided and delivered the address of welcome, to which Chester A. Fulton, president A.I.M.E., and E. G. Bailey, representing R. M. Gates, president A.S.M.E., responded. Mr. Bailey read a letter from Mr. Gates in which he complimented the two divisions on the excellence of their work. He referred also to the scholarship fund of the A.I.M.E. Committee on Promotion of Student Interest to encourage students in coal mining. He inferred, he said, that "the objective is largely limited to undergraduate work," and he suggested that the committee "consider a plan to offer encouragement and financial aid for advanced engineering study."

Papers presented at the session Monday morning were on "Industrial Coal Requirements of the Kanawha Valley," by T. W. Harris, Jr., of E. I. du Pont de Nemours and Company, Inc., and "National Fuel Efficiency Program," by T. C. Cheasley, U. S. Bureau of Mines, who will be remembered as one of the speakers at the Fuel Session at the 1944 A.S.M.E. Spring Meeting, Birmingham, Ala. W. G. Christy, member A.S.M.E., co-ordinator under the National Fuel Efficiency Program for the Hudson County, N. J., area, and W. B. Hurley, for the Detroit area, told about the working of the program in their particular localities.

"Coal Facts, Coal Characteristics, and Imagineering With Underfeed-Stoker Fuel Beds" was the subject of a paper presented at the Monday afternoon session by L. A. Shipman, member A.S.M.E., Southern Coal and Coke Co., Knoxville, Tenn. The other papers presented at this session on coal utilization were one by H. C. Carroll, member A.S.M.E., of the Commercial Testing and Engineering Company, Chicago, Ill.; whose subject was "The Design of Small Power Plants," and a second by J. D. Clendenin, K. M. Barclay, and C. C. Wright, of the Pennsylvania State College, entitled, "Use of Anthracite Fines in By-Product Coke Production."

Two Inspection Trips Offered Visitors

Two inspection trips were offered to engineers in attendance at the Conference on Monday evening, one to the synthetic-rubber plant of the United States Rubber Company, and the other to the Cabin Creek Power Plant of the Appalachian Electric Power Company.

Papers on Mechanized Mining and Coal Utilization

Three papers on mechanized mining were presented at the session on Tuesday morning. W. T. Brown, consulting engineer, Pittsburgh, Pa., described "Forms of Sulphur in Coal and Their Origin;" W. W. Beddow, Logan County Coal Corporation, presented a paper "Variable Seam Conditions Encountered in Mechanical Mining and How They Are Met;" and E. C. Carris of the Island Creek Coal Company, spoke on "Tipple Problems Under Mechanical Mining," the last two being discussed together.

At the afternoon technical session, R. F. Stilwell, North American Coal Corp., Cleveland, Ohio, spoke on "Blending Coals for Better Product Control," and B. A. Landry, member A.S.M.E., of the Battelle Memorial Institute, Columbus, Ohio, discussed "The Missing Data on Coal Sampling."

P. G. Lazzell Speaks at Luncheon

The speaker at the luncheon on Tuesday was P. G. Lazzell, a member of the recent Coal Mission to Great Britain, who took for the subject of his address, "Possible Postwar Conditions of English Coal Mines."

A.S.M.E. Calendar
of Coming Meetings

April, 1945
A.S.M.E. Spring Meeting
Boston, Mass.

June, 1945
A.S.M.E. Semi-Annual Meeting
Chicago, Ill.

Banquet Concludes Conference

A banquet held at the Daniel Boone Hotel on Tuesday evening closed the two-day Conference. Harry G. Kennedy, Labor Commissioner of the Kanawha Coal Operators Association of Charleston, acted as toastmaster. The principal address was delivered by Sidney H. Haughton, director, Geological Survey, and chairman, Fuel Research Board, Union of South Africa, whose subject dealt with "Fuel in South Africa; Past, Present, and Future."

J. B. Morrow Receives Percy Nicholls Award

Following the banquet, Howard N. Eavenson, past-president A.I.M.E., presented the Percy Nicholls Award to J. B. Morrow, president of the Pittsburgh Coal Co. This award consists of a framed certificate which is presented at the joint annual meeting of the Coal Division of the A.I.M.E., and the Fuels Division of the A.S.M.E. The recipient is selected by a joint committee of these two divisions and the award is also financed by the divisions. Previous awards have been made to E. G. Bailey and to Henry Kreisinger.

Mr. Eavenson paid a warm tribute to Mr. Morrow and reviewed his engineering career in Canada, the land of his birth, and the United States, the land of his adoption. The citation on the Award read:

Citation

"His technical contributions to the art of coal preparation and to the science of sampling and testing and to the interpretation of these are widely recognized and used.

"His early recognition of the mutual advantages of scientific co-ordination of production and preparation of coal with consumer requirements and his work to that end have contributed substantially to the achievement of the optimum.

"In him we recognize not only an engineer and a scientist but also an able executive who always imparts freely of his knowledge and whose accomplishments provide inspiration of a special value to young engineers, of whom he has assisted many to professional success."

President's Page

Organization Counts

ANOTHER year in the Society's affairs has passed and the new officers, whom you honored by election to their respective offices to direct the Society's business for the coming year, greet you.

Your Council, with the co-operation of the chairmen of the committees, divisions, and sections, the Society's staff, and the hundreds of members who in one way or another are taking a part in the Society's activities, confidently hopes to carry on the fine record left by those who have gone before and to maintain the high standard they have set. We all must realize that the success of an organization such as ours cannot depend on the efforts of a few, but on the combined, concerted efforts of the whole Society membership. Your Council bespeaks your continued and increasing co-operation.

The outstanding characteristic of every successful enterprise at the present time is good organization. The war has demonstrated the importance of organization as it has never been demonstrated before; organization of industry and the armed forces, organization not only of men but of equipment and its use. Organization is the slogan of the day. While industry has proved the importance of organization very conclusively over the past several decades, it must again develop peacetime organizations which will insure our economic security and maintain our enviable position in the social structure of the world when the present crisis has passed. We have the people, the natural wealth, the prestige, and ingenuity; all that is necessary is good organization to combine all these resources and make them effective.

The engineer's place in this machine and power age is unquestioned. Let us then apply the lesson we are learning to our Society and its operation and adapt to it the principles we have preached and practiced in our everyday lives. Only by good organization, everyone doing his part well, can we succeed in making our Society of greater use to our profession and to society generally. Only in this way can we strengthen our profession and enhance its importance. Only by a growing, vigorous, efficient organization can our Society attain the position we would all like to see it hold in the days ahead when engineers will be called upon to perform greater tasks than ever before—tasks not only in the technical field but in the economic and humanitarian fields as well.

(*Signed*) ALEX D. BAILEY, *President, A.S.M.E.*

Actions of A.S.M.E. Executive Committee

At a Meeting Held at Headquarters, Oct. 17, 1944

A MEETING of the Executive Committee of the Council of The American Society of Mechanical Engineers was held in the Society rooms, Engineering Societies Building, New York, N. Y., on Oct. 17, 1944. There were present R. M. Gates, chairman; A. C. Chick and A. R. Stevenson, Jr., of the Committee; J. J. Swan and G. L. Knight (Finance); A. R. Mumford (Local Sections); W. M. Sheehan (Professional Divisions); W. G. Christy and R. F. Gagg, Council members; Alex D. Bailey, president-elect; and C. E. Davies, secretary.

Actions of general interest were as follows:

Pension Plan

A pension plan for employees, prepared by a subcommittee of the Finance Committee, was presented in outline and approved in principle.

Members in Enemy Countries

The President was requested to consult the Joint Conference Committee as to the desirability of a uniform policy for dealing with members in enemy, liberated, and neutral countries.

Co-Operation With Other Societies

The Secretary was requested to outline a broad program of possible co-operation with other societies in the mechanical-engineering field.

Membership Development

The following recommendations of the Membership Development Committee were accepted and the Committee on Constitution and By-Laws was requested to prepare suitable amendments to the By-Laws:

1 That the executive committee of the Membership Development Committee be reappointed in whole or in part for the ensuing year and that the personnel continue to include, ex-officio, representatives of the Standing Committees on Professional Divisions, Local Sections, Relations With Colleges, and Admissions.

2 That the subject of membership development needs more extensive attention and a Standing Committee should manage this, the By-Laws and Rules to be changed as required to include such a standing committee.

3 That the exact form of the large committee be left to the executive committee of the Membership Development Committee.

Confirmation of Presidents' Actions

Confirmation was voted of letter-ballot approval of the press release issued jointly by the presidents of five engineering societies and of their letter to The Secretary of State. (See MECHANICAL ENGINEERING, November, 1944, pages 748–749.) Confirmation was also voted of letter-ballot approval of the President's letter to members in the armed forces. (See MECHANICAL ENGINEERING, November, 1944, page 747.)

Certificate of G. A. Gaffert

The request of the Power Division to issue a Certificate of Award to Gustaf A. Gaffert, "for his services over a period of years on the Power Division, serving as chairman in 1939 and again in 1944" was granted.

Hoover Medal

It was reported that the Hoover Medal Board of Award had elected Ralph E. Flanders, past-president A.S.M.E., seventh recipient of the Hoover Medal (1944).

Guggenheim Medal

It was reported that the Guggenheim Medal Board of Award had been reorganized and that its rules had been revised to provide that three members of the Board shall be designated by each of the three participating societies.

Appointments

The following appointments were approved.

Boiler Code Subcommittees:

Unfired Pressure Vessels (reorganization), Walter Samans, chairman, R. E. Cecil, H. C. Boardman, Paul Diserens, W. D. Halsey, A. J. Ely, D. B. Rossheim, and D. B. Wesstrom

Power Boilers, W. D. Halsey

Material Specifications, W. Paul Gerhart

Co-Ordination, H. B. Oatley

Nonferrous Materials, H. L. Berghoff

Special Design, E. C. Korten

Welding, K. L. Walker

Code Symbols, C. O. Meyers, chairman, H. E. Aldrich, W. D. Halsey

Executive Committee, H. C. Boardman, A. J. Ely.

E. F. Church Heads Engineering Societies Library Board

AT A meeting of the Library Board of the United Engineering Trustees, Inc., held in the Engineering Societies Building, New York, October 19, Prof. E. F. Church, Jr., member A.S.M.E., Polytechnic Institute of Brooklyn, was elected chairman. Other members of the Executive Committee elected were Robert H. Barclay, vice-chairman, and E. P. Hamilton, George L. Knight, T. T. Read, and John Blizard.

P. H. Hardie, of Sanderson and Porter, New York, N. Y., became a member of the Board as a representative of A.S.M.E., succeeding A. R. Mumford. Other representatives of the A.S.M.E. are John Blizard and E. F. Church, Jr.

Library Widely Used

Statistics for the year ending Sept. 30, 1944, showed gratifying increases in the use and services of the Library. Although the number of visitors decreased from 22,260 in 1942-1943 to 21,992 in 1943-1944, the number of other users increased from 13,579 to 15,147, so that the total number of users increased from 35,839 to 37,139.

That the members of the Founder Societies living outside the metropolitan area are taking advantage of the privilege offered by the Board during recent years of borrowing books for personal use is shown by the fact that the number of borrowers has grown from 650 to 1133 in the last two years, and the number of books borrowed from 846 to 1533. During this same period the number of photostat prints made by the library has increased from 31,254 to 53,518.

Other services of the library—answers to telephone inquiries, searches, and copies of articles and translations—have exhibited normal growth. Only in the number of acquisitions and books reviewed have decreases been reported. Inability to get technical books from Europe and the great number of books published for instruction for war purposes are given as reasons for the decrease in volumes important enough to be added to the Library.

At present the Library contains 158,521 volumes, 8392 maps, and 4654 searches.

United Engineering Trustees Officers Elected

F. MALCOLM FARMER, who is a member of the A.S.M.E. and vice-president and consulting engineer of the Electrical Testing Laboratories, New York, N. Y., an authority on electrical measurements, electrical insulating materials, and high-voltage cables, has been re-elected president of United Engineering Trustees, Inc., the joint agency of the four national societies of civil, mining and metallurgical, mechanical, and electrical engineers. He has represented the last named society on the Board of United Engineering Trustees since 1937.

Other officers elected include Arthur S. Tuttle, consulting engineer as vice-president, Everett S. Lee, member A.S.M.E., engineer in charge, general engineering laboratory, General Electric Company, as vice-president; George L. Knight, fellow A.S.M.E., chairman of the Finance Committee; A. L. Queneau, chairman of the Real Estate Committee, Albert Roberts, treasurer, and C. R. Jones, assistant treasurer. John H. R. Arms, general manager of the Corporation, continues as secretary.

Engineering Foundation Elects Officers

THE Engineering Foundation at its annual meeting held recently at 29 West 39th St., New York, N. Y., re-elected A. L. Queneau, metallurgist of the United States Steel Corporation, as chairman for the ensuing year. A. B. Kinzel, chief metallurgist of Union Carbide & Carbon Research Laboratories, Inc., was elected vice-chairman; Edwin H. Colpitts, formerly director of the Bell Telephone Laboratories, was re-elected director, and John H. R. Arms, re-elected secretary.

The Research Procedure Committee will be composed of L. W. Chubb, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., E. A. Prentis, Jr., Spencer, White, & Prentis, Inc., Prof. H. E. Wessman of New York University, W. M. Peirce of the New Jersey Zinc Company; Prof. W. Trinks of Carnegie Institute of Technology, and Dr. W. A. Lewis of Cornell University. Mr. Queneau will represent the Engineering Foundation on the Executive Board of the National Research Council.

Seven researches, many of importance to war work were conducted during the year just closed covering the various fields of engineering. These projects included work on soil mechanics and foundations, critical-pressure steam boilers, unsteady-heat-flow investiga-

tions, plastic flow of metals, and co-operated with the Welding Research Council, Engineers' Council for Professional Development, and the National Academy of Sciences.

John Fritz Medal for 1944 to John L. Savage

THE John Fritz Medal for 1944, highest distinction in the engineering profession, has been awarded to John L. Savage, chief designing engineer for the U. S. Bureau of Reclamation and consulting engineer for the Tennessee Valley Authority, it has been recently announced. The award to Mr. Savage was made in recognition of "superlative public service in conceiving and administering the engineering of mammoth dams, both in America and beyond the seven seas."

The Medal is sponsored by the American Society of Civil Engineers, The American Society of Mechanical Engineers, American Institute of Electrical Engineers, and the American Institute of Mining and Metallurgical Engineers. Previous recipients of the Medal, which is awarded in recognition of distinguished contributions in the field of applied science, include Thomas A. Edison, George W. Goethals, Orville Wright, Herbert Hoover, Guglielmo Marconi, George Westinghouse, and Willis Rodney Whitney.

A.T. & T. Announces Frank B. Jewett Fellowship

THE American Telephone and Telegraph Company has announced the establishment of a trust fund to finance postdoctorate fellowships in physical science in honor of Dr Frank B. Jewett, president of the National Academy of Sciences and, until his retirement from active telephone service at the end of September, vice-president of the American Telephone and Telegraph Company in charge of development and research.

Five fellowships will be awarded annually to stimulate and assist research in the fundamental physical sciences, and particularly to provide the holders with opportunities for individual growth and development as creative scientists. The fellowships provide an annual honorarium of $3000 to the holder and $1500 to the institution at which the recipient elects to do research.

The Frank B. Jewett Fellowships will enable their recipients to devote themselves to research in pure science for a year or two following their doctorates. Since a purpose of the fellowships is to provide for the full-time continuation of academic research, awards will normally be made to those who have obtained the doctorate within the preceding year, or are expected to receive that degree not later than the beginning of the next fellowship term which starts each July first.

The fellowships will be awarded on recommendation of the Frank B. Jewett Fellowship Committee. This committee will consist of seven members of the scientific staff of Bell Telephone Laboratories who are actively and creatively engaged in research in the respective fields of physics, mathematics, and chemistry.

In the selection for fellowship awards the primary criteria will be demonstrated research ability of the applicant, the fundamental importance of the problem he proposes to attack, and the likelihood of his growth as a scientist.

Selection for a fellowship award and its acceptance shall involve no implication or commitment on the part of Bell Telephone Laboratories or on the part of the recipient as to later employment in the Laboratories.

Fred H. Colvin Gets Honorary Degree at Stevens

AT the commencement exercises of Stevens Institute of Technology, Hoboken, N. J., Oct. 28, 1944, Fred H. Colvin, fellow A.S.M.E. and recipient of the Worcester Reed Warner Medal in 1942, editor emeritus of the *American Machinist*, received the honorary degree of mechanical engineer with the following citation:

"Fred Herbert Colvin, author and editor; an author of best sellers, including the 'American Machinists' Handbook,' of which nearly a half million copies have been sold, the 'Aircraft Handbook,' and more than thirty other books and hundreds of articles dealing with machine-shop practice and management; an editor of technical journals who began his editorial career just 50 years ago as the first editor of the magazine *Machinery* and now enjoys a dynamically active retirement as editor emeritus of the magazine *American Machinist* after 32 years of editorial management of that one journal; a specialist on machinery methods, he has been adviser on machine tools to the British Purchasing Commission, the U. S. Navy Bureau of Aeronautics, and the Office of Production Research and Development of the War Production Board. The grandson of a gunsmith, the son of a locomotive engineer, the father of a Stevens Alumnus, and the grandfather of a Stevens undergraduate, I present to you, sir, a veteran, counselor of American industry."

Left to right: LIEUT. COL. EDWARD GRAY, COL. SCOTT B. RITCHIE, MAJOR GENERAL C. T. HARRIS, JR., JAMES L. WALSH, CHAIRMAN OF THE A.S.M.E. WAR PRODUCTION COMMITTEE, COL. GEORGE G. EDDY, LIEUT. COL. THOMAS F. COLLERAN

A.S.M.E. MEMBERS AND THEIR HOSTS MAKING AN INSPECTION TOUR

(A.S.M.E. Members Visit Aberdeen Proving Ground, October 4, 1944. For story see MECHANICAL ENGINEERING, November, 1944, page 752.)

Among the Local Sections

DELEGATES AT ANNUAL MEETING OF REGIONAL GROUP IV, ATLANTA, GA., SEPT. 22-23 (*Left to right, seated:* Ernest Hartford, D. A. Rogers, R. W. Morton, J. W. Parker. *Standing:* B. E. Fernow, S. D. Moxley, D. H. Guldberg, E. E. Williams, P. R. Yopp, and F. H. Thomas.)

Delegates of Group IV Honored by Atlanta Section

REGIONAL Group IV held its annual meeting on September 22-23, as guests of the Atlanta Section, Atlanta, Ga. The meetings, at which the various problems of the group were discussed, were presided over by Paul R. Yopp of The Babcock & Wilcox Company, Atlanta. Delegates of the group were honored at a luncheon held on the first day's meeting in the rathskeller of the Ansley Hotel, Atlanta, and included Ernest Hartford, assistant secretary, New York, N. Y.; D. A. Rogers, Hopewell, Va.; R. W. Morton, Knoxville, Tenn.; B. E. Fernow, Clemson, S. C.; S. D. Moxley, Birmingham, Ala.; D. H. Guldberg, Birmingham, Ala.; E. E. Williams, Charlotte, N. C.; F. H. Thomas, Knoxville, Tenn.

Prof. P. H. Nelson Explains "Radio Ranging" at Bridgeport

Bridgeport Section held its first dinner meeting in many years on October 19, at the Hotel Barnum, Bridgeport, Conn., at which Prof. Paul H. Nelson, assistant professor of electrical engineering at the University of Connecticut, spoke on radio detecting and ranging. Professor Nelson was well qualified to present his subject, having had a wide and varied experience in the communication and high-frequency engineering fields, working as radio engineer with Westinghouse, RCA-Victor, and the United States Forest Service. He did research and graduate study in the ultra-high-frequency field at Ohio State University, and taught communication engineering with emphasis on television, frequency modulation, h-h-f techniques, and allied subjects.

Advanced Engineering Standards Discussed at Central Illinois Conference

Advanced standards of engineering, with a slant on postwar changes depending upon laws that govern evolutionary theories in the scientific world, were discussed at the two-day regional conference which was held by the Central Illinois Section, at the Hotel Pere Marquette, Peoria, Ill., on September 28–29. This Section, known as Group 6, was host to various chapters of the Midwest area, two national vice-presidents, a national secretary, and officers of the Section.

R. T. Mees, chairman of this Section, announced that these conferences are held four times a year, and that in reality they constitute a clearing house of discussions, the findings of which are subject to very democratic rules, and are distributed among the 20 sections of the organization, with an approximate combined membership of 18,000.

T. S. Ewan, national vice-president, told the audience that the purpose of these meetings was to promote the arts and sciences in the light of postwar developments. The field, he explained, embraces the allied branches of industry as well. Group 6 encourages scientific research and fosters engineering education among high schools.

Another of the postwar issues thoroughly discussed at this conference was that of providing adequately for the men returning from the armed forces, particularly those who were engineers before entering service.

Officials attending the conference included: T. S. Ewan, national vice-president, Chicago, Ill.; David Larkin, national vice-president, St. Louis, Mo.; Ernest Hartford, executive assistant secretary, New York, N. Y.; W. L. H. Doyle, Peoria chairman of professional division, and R. T. Mees, chairman of the Central Illinois Section.

"Explosives and Explosions" Is Topic at Chicago

Lieut. Colonel C. S. Robinson, guest speaker at the October 24 meeting of Chicago Section, gave an interesting talk on "Explosives and Explosions." Colonel Robinson, of the United States Army Ordnance Department, and formerly professor of chemical engineering at the Massachusetts Institute of Technology, is recognized as one of the country's outstanding authorities on military and industrial explosives. He outlined the mechanisms of explosions and their effect and then gave pertinent information on some of the famous explosions of history.

Dr. L. S. Marks Lectures at Central Indiana Section

Reflecting an optimistic future for gas turbines in certain applications, Dr. L. S. Marks highly impressed 425 members and guests of the Central Indiana Section at a meeting on October 20. By the use of slides, Dr. Marks illustrated the simplicity of the gas turbine as compared with, what he jokingly called, "reciprocating nightmares." He said he expected a vague future for jet propulsion, except in special applications, of which Germany's robot bomb happens to fulfill one.

Cleveland Section Entertains Society President

An informal meeting was held on October 19, by the Cleveland Section, at which R. M. Gates, president of the A.S.M.E., gave a brief but instructive résumé of the Society's activities during the last year.

Glass Developments Heard at Columbus Meeting

The first meeting of the 1944-1945 semester of Columbus Section was held jointly with members of the A.I.E.E. at Battelle Memorial Institute on October 18, at which C. J. Phillips, manager, Electronic Sales Department, Corning Glass Works, Corning, N. Y., spoke on the topic of "Recent Developments in Glass." Mr. Phillips covered the manufacture of ordinary glass and briefly discussed the latest developments such as precision forming to tolerances of thousandths of an inch, minute radio tubes, glass condensers, and the like.

Gas-Turbine Uses Reviewed at Dayton Section

Dr. Lionel S. Marks delivered an address at the Dayton Engineers' Club on October 18, to an audience of approximately 450 members and guests of the Dayton Section. A complimentary dinner was served previous to the meeting which was attended by about 60 persons. Dr. Marks spoke on the subject of "Gas Turbines, Jet Propulsion, and Rockets," which he presented in an extremely interesting manner.

Two Well-Attended Meetings Reported by Detroit

One hundred and seventy members of the Detroit Section met on October 3, at the Willow Run Bomber Plant, Detroit, Mich., to inspect one of the great engineering achievements developed during the present conflict. This Branch met again on October 25 to hear Dr. L. S. Marks trace the development of gas turbines, jet propulsion, and rockets. About 600 members and guests attended the lecture.

Dr. A. S. Fleming Speaks at Washington Section

"Has the Engineer Attained Professional Status?" was the question asked by Dr. Arthur S. Fleming, United States Civil Service Commissioner, at the October 12 meeting of the Washington, D. C., Section, held in the P.E.P. Company Auditorium, Washington, D. C. Answering his own question in the affirmative, Dr. Fleming then talked at length of postwar civil-service conditions and requirements, as affecting civil-service engineers, temporary war appointments, and the return of veterans to civil life.

Forging Course Outlined at Fort Wayne Section

J. J. Laughlin of the Chambersburg Engineering Company, Chambersburg, Pa., at the October 5 meeting of Fort Wayne Section, held in the Chamber of Commerce Building, Fort Wayne, Ind., explained his company's forging course. The course, Mr. Laughlin said, covered the subjects of drop hammers, forging design, die design, and the reason for using forgings. He also discussed his company's new "Cecostamp" process, developed for forming sheet metals.

Kansas City Members Learn More About the A.S.M.E.

The place of the A.S.M.E. in the world today and the duty of its members were disclosed by Eugene O'Brien, at the September 18 meeting of Kansas City Section, at the University Club, Kansas City, Mo. Mr. O'Brien spoke of the many opportunities open to student members, and gave some helpful suggestions for constantly increasing the Society's value. At the October 16 meeting of this Section, aviation in wartime, together with postwar problems facing the commercial air lines, was briefly discussed by Robert Whitmer.

Western Massachusetts Holds Dinner Meetings

The first regular monthly dinner meeting of the 1944-1945 semester was held by Western Massachusetts Section on September 19, at the Hotel Sheraton, Springfield, Mass. The guest speaker of the evening was Fred K. Fisher, turbine application engineer, Westinghouse Electric & Manufacturing Company, South Philadelphia, Pa., who gave an illustrated lecture on, "The Combustion-Gas Turbine." At the October 17 dinner meeting held in the same hotel, members of this Section heard T. B. Hayward, wool authority and consultant to the Government, manager, wool department, Swift & Company, Philadelphia, Pa., speak on the subject of, "The Commercial Dignity of the Golden Fleece." Mr. Hayward gave a brief résumé of the history of wool. He referred to synthetic fibers, and while he said he did not believe that wool would be replaced by synthetics, he did see where some advantages might be gained by blending the two products. A question period concluded the session.

High-Speed Milling Topic at Milwaukee Meeting

High-speed milling of steel was the topic discussed at the October 11 meeting of the Milwaukee Section, City Club, Milwaukee, Wis., by Dr. Horace Frommelt. Dr. Frommelt explained how milling speeds have increased from 75 fpm to 750 fpm and tooth loads from 0.005 in. to 0.15 in. per tooth, with a resultant production increase as high as 400 per cent.

New Haven and A.S.H.&V.E. Hold Joint Meeting

Prof. Lauren E. Seeley spoke on the subject, "The Nasal Cavity as an Air Conditioner," at the October 11 meeting of the New Haven Section, held jointly with members of the Connecticut Section of the American Society of Heating and Ventilating Engineers. Professor Seeley's comments were in the nature of a report on a series of experiments conducted over a wide range of conditions to determine the action of the nasal cavity on air during inspiration and expiration relating to heating and humidifying.

Mobile Power Plant Described at New London Meeting

Members and guests of the New London Section met at the Mohican Hotel, New London, Conn., on October 18, to hear C. L. Southmayd of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., describe the 5000-kw mobile power-generating plant, built for the United States Navy. Mr. Southmayd revealed that, to date, 10 of these units, as well as 20 smaller types, have been sold to the Russian Government.

F.B.I. Agent Heard at Plainfield Section

The October 4 meeting of Plainfield Section was held at the Elks Club, Elizabeth, N. J. Special Agent John Colin Robinson of the F.B.I. talked about the F.B.I. in wartime. He high-spotted his lecture by the use of a film issued by *The March of Time* entitled, "The F.B.I. Front."

Casting Applications Defined at Providence Section

Paul L. Butler spoke on the subject, "Applications of Precision Castings," at the October 3 meeting of Providence Section. Mr. Butler showed samples of precision-cast parts and described their process, limitations, and advantages, comparing them with other methods of casting.

Raleigh Section Inspects $13,000,000 Power Plant

Accompanied by 25 members and guests of Raleigh Section, Frank Turner sponsored an instructive inspection tour of the $13,000,000 Carolina Power & Light plant at Moncure, N. C., on October 14. A picnic supper concluded the tour, after which Mr. Theiss gave an interesting account of a recent group conference.

Review of Coated Abrasives Given at Rochester

An historical review of the manufacture of coated abrasives on both paper and cloth was given by Charles H. Weston, division manager, field engineering, Behr-Manning Corporation, Troy, N. Y., at the October 26 meeting of Rochester Section. Mr. Weston also reviewed the use of natural abrasive material

AT THE DINNER MEETING OF THE ROCK RIVER VALLEY SECTION AT THE HOTEL HILTON, ROCKFORD, ILL., OCT. 4

AT THE SPEAKERS' TABLE, ROCK RIVER VALLEY SECTION DINNER MEETING, OCT. 4
(*Left to right:* L. A. Wilson, vice-president of the Section, presiding officer; L. E. Endsley, speaker; and F. P. Grutzner, who introduced Dr. Endsley.)

and gave a description of the modern manufacture of synthetic types. He illustrated his lecture with moving pictures, which showed the manufacture of these materials and their application to industrial use.

Future of Diesel Engine Outlined at Rock River Valley Section

Dr. L. E. Endsley, Pittsburgh, Pa., consulting engineer for Fairbanks, Morse & Company, Chicago 1, Ill., and widely known as a railroad consultant, on October 4 discussed the growth and future possibilities of the Diesel locomotive at a dinner meeting of the Rock River Valley Section at the Hotel Hilton, Rockford, Ill.

From the time the first Diesel locomotive was produced in 1925, until quite recently, the growth of the industry has been slow. By 1935, only 234 were in use, and even today Diesels produce only 3 per cent of the 109,000,000 horsepower used in locomotives in the United States. However, because of its many advantages, Dr. Endsley predicted that the Diesel locomotive would assume an important place in postwar motive-power developments.

Colorful Sessions Reported by San Francisco

Performance of the construction industry in action on Pacific battle fronts was colorfully revealed in an illustrated lecture by Dr. Nathan A. Bowers on September 20, before members of the San Francisco Section, who were guests of the American Society of Civil Engineers, and the Structural Engineers Society of Northern California. The meeting, which was held in the auditorium of Pacific Gas & Electric Company, San Francisco, Calif., proved extremely interesting to the more than 450 members and guests in attendance. San Francisco Section held a dinner meeting on September 28 in the Engineers' Club, San Francisco, to hear Dr. A. Allan Bates speak on "Plastics Versus Metals." Dr. Bates, who is manager of the chemical and metallurgical department, Westinghouse Electric & Manufacturing Company, research laboratories, East Pittsburgh, Pa., discussed the nature of plastics, their chemical and physical characteristics, and reviewed the application of plastics and other engineering materials.

Southern California Hears Dr. Bates Discuss Plastics

Southern California Section held a dinner meeting at the Clark Hotel, Los Angeles, Calif., on September 26. The guest speaker for the evening was Dr. A. Allan Bates, manager of chemical and metallurgical department, Westinghouse Electric & Manufacturing Company's research laboratory, East Pittsburgh, Pa. Dr. Bates gave a very interesting illustrated talk on "Plastics Versus Metals," showing numerous samples of plastic materials in various forms.

Subject at Syracuse Is Logistics

Col. James L. Walsh gave an informal talk on the subject of "Logistics," at the October 2 meeting of Syracuse Section, at which 90 members and guests were in attendance. A discussion period followed Colonel Walsh's remarks.

East Tennessee Section Gets Engineering Research Data

On October 26, the East Tennessee Section held a meeting at the University of Tennessee, Knoxville, Tenn., to hear W. H. Baskervill give an excellent review on "Tennessee Engineering Research Looks to the Future."

Logistics and Gas Turbines Subjects at West Va.

"Logistics—the Key to Quick Victory," was the topic discussed by Col. James L. Walsh at the September 26 meeting of West Virginia Section at the Daniel Boone Hotel, Charleston, W. Va. Colonel Walsh defined logistics, the science of survival, and described its application in the present war. The interrelationships between strategy, logistics, and tactics were explained and illustrated by reference to the early campaigns of the war. At a well-attended meeting of this Section at Stonewall Jackson High School, Charleston, W. Va., on October 16, Prof. L. S. Marks spoke on the subject of "Gas Turbines, Jet Propulsion, and Rockets."

Drydock Problems Defined at Western Washington

"Yankee Engineering Solves Drydock Problem in South Pacific," was the topic discussed by Thomas M. Rowlands, naval architect, Everett-Pacific Shipbuilding & Drydock Company, Everett, Wash., at the October 4 meeting of Western Washington Section. Mr. Rowlands showed slides and gave some concrete facts covering various types of sectional floating drydocks being built for the Navy Department by his company.

Admiral Cluverius Addresses Worcester Section

"If industry does not win the war the war will not be won without it," declared Rear Admiral Wat Tyler Cluverius, president of the Worcester Polytechnic Institute, at the October 6 meeting of Worcester Section. Reviewing his experience as a member of the Navy's Board of Production Awards, visiting 115 plants for presentation of Army-Navy "E" pennants for production excellence, the speaker cited many examples of wartime industrial conversion. Industry is the armed services' greatest ally, Admiral Cluverius said, but the current talk of "victory in sight" is creating one of the most distressing developments in the nation today. He said it was prompting many persons to resign from war jobs, particularly women workers.

A.S.M.E. Local Sections

Coming Meetings

Akron-Canton. December 6. Woman's City Club, 34 S. High St., Akron, Ohio at 6:30 p.m. Subject: "Variable Orifice Flowmeters," by Kermit Fischer, president, Fischer and Porter.

Birmingham. February 14, 1945. Tutwiler Hotel, Birmingham, Ala. Subject: "High-Pressure, High-Temperature Steam Generators," by Otto de Lorenzi, Combustion Engineering Co., Inc.

Boston. December 14. 8:00 p.m. Subject: "The Unwritten Laws of Engineering," by W. J. King, engineer, supercharger engineering division, General Electric Co., Lynn, Mass.

Bridgeport. December 14. Hotel Barnum, Bridgeport, Conn. at 8:00 p.m. Subject: "Modern Miracles in Glass," by C. J. Phillips, chief research engineer, Corning Glass Co., Corning, N. Y.

Central Illinois. December 14. Subject: "Mobile Steam Power Plants," by F. G. Ely, engineer, Babcock and Wilcox Co., New York, N. Y. This will be an illustrated lecture.

Central Indiana. December 8. Antlers Hotel, Indianapolis, Ind., at 8:00 p.m. Subject: "Industrial Postwar Planning," by Raymond Pike, director of Indiana Economic Council.

Detroit. December 5. E.S.D. Auditorium at 8:00 p.m. Dinner will be served in the

E.S.D. special dining room at 6:30 p.m. Subject: "Development of a Round-Type Diesel Engine," by Allison L. Bayles, American Engineering Co., Philadelphia, Pa. (formerly director of research and development, Rogers Diesel & Aircraft Corporation, New York, N. Y.).

New London. December 13. Mohican Hotel at 8:00 p.m. Subject: "Engineering Problems of Textile Machinery," by W. McLeod Fraser, vice-president and plant manager, Atwood Machine Co., Stonington, Conn.

New Haven. January 10, 1945. Mason Laboratory, New Haven. Joint meeting with the Yale University Student Branch. Subject: "Electronics in Industry," by J. D. Hopkins Yale Student Branch. A. Hasbrouck, chief of engine-design section of Pratt & Whitney Aircraft Division, of United Aircraft Corporation will also speak at the meeting.

Ontario. December 14. Hart House, University of Toronto at 6:15 p.m. Subject: "Importance of Fluid Flow to the Engineer," by K. F. Tupper, Turbo Research Limited.

Philadelphia. December 12. Engineers Club, Philadelphia, at 7:30 p.m. Subject: "How Public Utilites Have Met Increased Requirements in Wartime," by Horace Liversidge, president of the Philadelphia Electric Co. Harry Jordan, secretary of the American Water Works Association, will also talk.

Plainfield. January 17, 1945. Park Hotel Plainfield, N. J., at 8:15 p.m. Subject: "Plastics," by Islyn Thomas, president, Thomas Engineering Company; also a film on "The Shape of Things to Come."

Tri-Cities. December 15. Subject: "Mobile Steam Power Plants," by F. G. Ely, engineer, The Babcock and Wilcox Co., New York, N. Y. This will be an illustrated lecture.

Washington, D. C. December 14. Potomac Electric Power Co. Auditorium, Washington, D. C., at 8:00 p.m. Subject: "Civic Responsibility of the Engineer," by Roy V. Wright, Simmons-Boardman Publishing Company.

With the Student Branches

"Acoustics in Wartime" Outlined at Brown Branch

Professors Lindsay and Lawbaw of the Physics Department, BROWN UNIVERSITY on September 7, gave an interesting lecture to that Branch on, "Acoustics in Wartime." While the lecture briefly reviewed various applications of acoustics, it was primarily devoted to a discussion of supersonics, the transmission of supersonic waves in water, and their application to communications.

The featured speaker at the first meeting of the COLLEGE OF THE CITY OF NEW YORK BRANCH on September 28, was Prof. C. H. Kent, who briefly traced the history of the Engineering Societies. Professor Kent, as a member of the parent organization, was in a position to explain the many opportunities open to student members by continued membership in the organization, even after graduation. Various committees were appointed at the conclusion of Professor Kent's comments, after which the meeting adjourned. This Branch met again on October 5 to hear John Van Brunt, vice-president in charge of engineering for Combustion Engineering Company, Inc., New York, N. Y., deliver an interesting talk on the "Design of High-Pressure Boilers." Mr. Van Brunt illustrated his comments with numerous slides, which showed the construction and operation of various types of boilers. A discussion period concluded the session.

Legal and Technical Aspects of Safety Engineering at Columbia

Legal and technical aspects of safety engineering and their interdependence, were discussed by Prof. J. P. Gifford, assistant to the dean of the School of Law at Columbia University, on September 22, at a joint meeting of COLUMBIA BRANCH and members of the A.I.E.E., A.S.Ch.E., and A.S.C.E. A brief address was also delivered by Prof. Carl Kayan.

At an Executive Committee meeting of DREXEL BRANCH on October 3, it was decided to abandon the idea of combining with the other engineering societies on the campus for the reason that the organization would then become too complex. It was also decided that in the future, general meetings would be held on Monday evenings.

A résumé of activities at DUKE BRANCH was reported recently as follows: On August 1, this Branch completed its 1944 summer membership drive after obtaining approximately 25 new members, which brought the strength of the organization to about 70 members, the largest number the organization has reported in several years. Prof. R. E. Lewis, at the first meeting of the month, spoke on "The Arming and Armament of the Present Warship." At the August 22 session members met to see a motion picture on "Surface Condensers," while on September 9, the group made an inspection trip to the Sanford aircraft parts plant at Sanford, N. C. Plans for a smoker were prepared at the September 5 meeting, after which a short talk was delivered by E. K. Kraybill. The guest speaker on September 26 was Prof. F. J. Reed, who talked about "Design Problems in Modern Mechanisms." Election of officers featured the October 10 meeting, with the following results: A. C. Elkins, president; J. G. Kelly, vice-president; E. D. Williams, secretary, and J. Grubb, treasurer.

Additions to Mechanical-Engineering Laboratory at Kansas

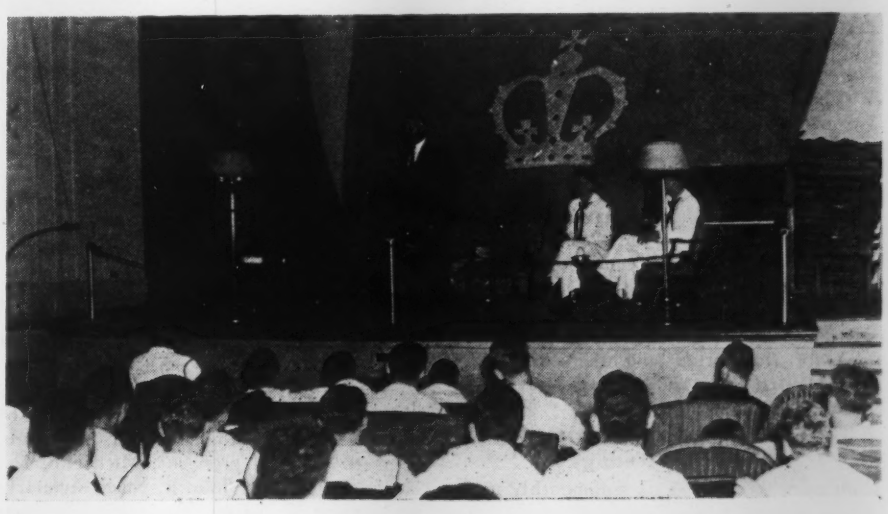
The gathering at the October 5 meeting of KANSAS UNIVERSITY BRANCH was addressed by two able speakers. Cecil T. Hough, manager, Kansas City Electric Power Company, Lawrence, Kan., spoke on the subject of "Mechanical Engineering in the Electric Power Field," while Prof. C. S. Gray, new head of the mechanical-engineering department of the university, discussed the additions to the mechanical-engineering laboratory and outlined his plans for strengthening the department.

A short business session was held on October 17 by MARQUETTE BRANCH regarding the advisability of transferring senior students from student status to junior status, after which the following officers were elected for the coming year: John Zuercher, president; Tim Rahill, vice-president; Thomas Cassidy, secretary, and Henry Berg, treasurer. The board of governors will consist of Messrs. Hargarten, Papachristou, Hanlon, Royce, Southwick, and Gerken.

Special-Treated Steel Discussed at Maryland Joint Meeting

MARYLAND BRANCH met for its fourth informal joint meeting on September 21, with members of the A.S.C.E., A.E.Ch.E., and A.I.E.E., at which Albert A. Smith of the United States Navy, Bureau of Ships, spoke on the subject of "Special-Treated Steel." Mr. Smith described the intricate problems of shipbuilding and in a pleasing manner offered practical suggestions for advancement in the business world after graduation.

Plans for the season's activities featured the first meeting of MICHIGAN COLLEGE OF MINING & TECH BRANCH on October 11. Among other things, it was decided to hold weekly meetings and to elect a new chairman,



PROFESSOR GIFFORD ADDRESSING THE JOINT MEETING AT COLUMBIA

to succeed the present chairman, who graduated recently.

In an effort to advise freshmen, as well as professional engineers, of the importance of becoming members of the A.S.M.E., George A. Feyerabend, President of MISSOURI SCHOOL OF MINES BRANCH, on October 5, outlined the purpose of the Society and the many opportunities given members to express individual ideas, after which he gave a preview of the activities planned for the fall term. Members then enjoyed a technicolor film, "The Flying Fortress," depicting the design, production, and use of one of the outstanding planes operated in war service.

On September 21, the NEW MEXICO COLLEGE OF A.&M. ARTS BRANCH met to enjoy a motion pictured entitled, "Flow," which portrayed the manufacture and use of valves. After viewing the film, a brief business session was held, at which Pete F. Triviz was elected secretary, succeeding Eugene Parks, who will shortly enter the armed forces, and Chester Rowland was elected a reporter and manager of publicity. This Branch met again on September 28, to act as host to the class of orientation in engineering; the dean of engineering, D. B. Jett; and Prof. M. A. Thomas, head of the electrical-engineering department. Joe Budenholzer and John R. Sellars gave short talks on the purposes of the engineering societies in existence on the campus, after which the group viewed a film on "From Bristles to Brushes," lent through the courtesy of the Castle Film Corporation, New York, N. Y.

"Fog" Control of Fires Explained at Northeastern Branch

After a brief business session on October 5, members and guests of NORTHEASTERN BRANCH enjoyed a technicolor motion picture entitled, "Water-Fog—Master of Fire," produced by the Rockwood Sprinkler Company of Worcester, Mass. The film showed how fires are controlled by means of breaking water into small sprays without the use of chemicals and with a minimum amount of water, and then gave specific instances in which "fog" could not control fires, i.e., deep-seated fires, as in coal piles, and those of long duration in which the woodwork has become thoroughly heated. An automatic heat-air-operated, tripping mechanism was also demonstrated. This Branch met again on October 24 to view a movie produced by the Glenn L. Martin Aircraft Corporation, Baltimore, Md., which described a test to destruction of a 100-ft PBM-3 bomber wing. Prior to viewing the film, members held a brief business session, at which it was decided to hold a smoker on November 9.

Steam—its origin, development, and use in connection with naval vessels was reviewed by Lieutenant Rutherford of the N.C.T.P., at the September 26 dinner meeting of OKLAHOMA BRANCH, held in the Woodruff Room, Memorial Union, on the campus of the University. Professor Dawson also spoke briefly on behalf of the Society, mentioning in particular the District Branch Meeting scheduled for the spring and the competitive awards given by the Society for papers on engineering subjects.

Purdue Branch Reports High Spots of Four Meetings

PURDUE BRANCH, at its semimonthly meeting on August 23, heard Grove Webster, supervisor of the Purdue Airport, speak on the history, development, and postwar plans of Purdue Airport. Mr. Webster pointed out that Purdue was the first college to participate in the CAA pilot-training program, which was later taken over by the United States Army Air Corps, and announced that an entire curriculum devoted to flight administration is being planned in order to train personnel for this branch of aviation. At the September 6 session Prof. Irving W. Burr, of the department of mathematics, made an interesting presentation on "Quality Control by Statistical Methods." Professor Burr said that quality-control technique may be defined as the application of proved laws of chance to determine the significance of variations in the quality of a product.

Members and guests of this Student Branch met again on September 19, to see two interesting steel films entitled, "Alloy Steel," and "Steel for Victory," while the October 4 meeting featured Prof. H. G. Venemann, who discussed "Refrigeration by Heat." He outlined the theory underlying the compression and absorption systems of refrigeration and pointed out the various problems encountered in adapting these systems to domestic refrigeration.

New Officers at Queens

The advisability of engineers becoming affiliated with professional societies was stressed at the October 5 meeting of QUEEN'S BRANCH by Major General Schmidlin. He deplored the fact that engineers often lacked ability to speak publicly, and because of this, it was decided that sufficient time will be set aside in the future to enable student members to address the meetings. The names of the new officers of this Branch were then announced, as follows: Major General Schmidlin, honorary chairman; Garnet D. Adams, chairman; Jack Soden, vice-chairman; Lloyd C. Secord, secretary, and Jack Keough, treasurer.

Election of officers took place at the first meeting of SANTA CLARA BRANCH on September 13, with the following results: John Bevis, chairman, assisted by Joseph Monroe, vice-chairman, and Joseph Spillane, secretary-treasurer. The remainder of the evening was then devoted to the guest speaker, E. Fox, chief draftsman of the Food Machinery Company, San Jose, Calif., who spoke on the topic of the "Water Buffalo," an amphibious tank which his company is constructing for the United States Government.

Power Plant Inspected by Southern California Branch

Accompanied by Professors Biegler and Angerman of the electrical-engineering department, members of the UNIVERSITY OF SOUTHERN CALIFORNIA BRANCH and members of the A.I.E. went on an inspection tour of the Long Beach Edison Steam Plant, on October 6. The group was privileged to see all of the boilers, turbines, generators, transformers, switching systems, power lines, and maintenance characteristics of No. 3 plant, which is the Edison Company's most recent power-generating unit. The October 11 meeting of this Branch was held for the specific purpose of electing officers for the new term. They are: Kenneth MacLeod, president; Michael Bealessio, vice-president; John R. Nash, secretary, and Robert W. Ritzel, treasurer. The committee officers include: Albert E. Graves, social chairman; Frank E. Fatis, chairman of papers, and Miss Shirli C. Allen, publicity chairman.

Series of Educational Programs Contemplated at Stevens

The main purpose of the August 31 meeting of STEVENS INSTITUTE OF TECHNOLOGY BRANCH was to prepare a series of educational programs, designed to acquaint the members with different phases of the engineering field. Three extremely interesting full-color, sound films were then viewed entitled, "The Story of FM," "Railroadin'," and "The World's Largest Electrical Workshop." On September 7, this Branch inspected a large industaial plant in Newark, N. J., particularly the powerhouse and the production equipment.

SWARTHMORE BRANCH met jointly with members of the Engineers' Club of this college on October 2, to see a motion picture entitled, "Building a Bomber," complete with sound, as well as a short film on Mexico.

Ira Hook, research engineer for the American Brass Company, Ansonia, Conn., gave an interesting lecture on the manufacture and application of copper and brass at the October 11 meeting of SYRACUSE BRANCH, at the conclusion of which he showed a technicolor movie entitled, "Copper Goes to War." A brief business session was held prior to Mr. Hook's presentation, at which the following were elected to office: William Jacob, chairman; George Ono, vice-chairman; Jack Silverman, secretary-treasurer, and Dr. R. G. Minarik, honorary chairman.

Air Transportation and Shell Testing Subjects Discussed at Texas Branch

Air transportation development was briefly discussed at the July31 meeting of the UNIVERSITY OF TEXAS BRANCH by John Frederick, professor of transportation at this university. Thirty-six members and guests were in attendance. The guest speaker at the October 2 meeting of this Branch was Lieut. Colonel M. D. Begeman, who talked about "The Testing of Ammunitions at an Ordnance Proving Ground." Colonel Begeman gave a short outline of the organization of the Army and then described the Proving Ground at Hope, Ark. He pointed out that the trend in testing at the Arkansas Proving Ground has been from light to heavy shells, and to rockets. Prior to Colonel Begeman's remarks, officers for the new term were elected as follows: Paul Woolrich, president; Anthony Maciel, vice-president; Robert Burns secretary, and Sydney Stokes, treasurer.

Ten-minute talks presented by students at three October meetings of YALE BRANCH were reported as follows: October 3: "Rudolph Diesel," by W. A. P. Meyer; "The Mechanical Equipment of the Sterling Library," by H. M. Shattuck; "The Man Who Saw All," by R. W. Cornell, and "War Photography," by H. M. Bowen. October 10: "George Frederick Gundelfinger—PhD," by R. E. Henrich; "Tailless Versus Conventional Airplanes," by H. Schindelman; unnamed paper, by F. D. Miller; "Fingerprinting," by G. P. Anastacion, and "Psychology," by F. W. Voos, Jr. October 26: "One Shot Color Photography," by L. P. Mitchell; "An Introduction to Marine Propellers," by R. C. Jones, and "The Disintegration of a Personality," by A. Sherman.

Papers on Smoke Prevention Available

THE Proceedings of the 38th Annual Meeting of the Smoke Prevention Association of America held at Detroit, Mich., June 6–9, 1944, has been published in book form. The book includes the many interesting papers read and presented at the meeting, with all discussions that followed, as well as numerous illustrations pertaining to the subject. Among the various papers presented are those on "Smoke Prevention and Fuel Conservation," "City Incineration," "Conservation After Combustion," "Pulverized Coal," "Overfire Air and Its Effect on Locomotive Smoke," etc.

Copies of the book, which is mimeographed and paper-bound, may be secured by writing Columbus D. Behan, Publicity Director, Smoke Prevention Association of America, Inc., 139 N. Clark Street, Chicago, Ill. at $2 each.

Engineering Societies Personnel Service, Inc.

These items are from information furnished by the Engineering Societies Personnel Service, Inc., which is under the joint management of the national societies of Civil, Electrical, Mechanical, and Mining and Metallurgical Engineers. This Service is available to members and is operated on a co-operative, nonprofit basis. In applying for positions advertised by the Service, the applicant agrees, if actually placed in a position through the Service as a result of an advertisement, to pay a placement fee in accordance with the rates as listed by the Service. These rates have been established in order to maintain an efficient, nonprofit personnel service and are available upon request. This also applies to registrants whose notices are placed in these columns. All replies should be addressed to the key numbers indicated and mailed to the New York office. When making application for a position include six cents in stamps for forwarding application to the employer and for returning when necessary. A weekly bulletin of engineering positions open is available to members of the co-operating societies at a subscription of $3 per quarter or $10 per annum, payable in advance.

New York	Boston, Mass.	Chicago	Detroit	San Francisco
8 West 40th St.	4 Park St.	211 West Wacker Drive	109 Farnsworth Ave.	57 Post Street

MEN AVAILABLE[1]

GRADUATE MECHANICAL ENGINEER, 30, five years' experience in design of automatic machinery, machine development, plant engineering, equipment engineering. Also 3 years' machinist experience. Desires responsible permanent position as development engineer. Me-875.

MECHANICAL ENGINEER, thorough knowledge Portuguese and Spanish, Bach. M. E., age 26, over 4 years' varied engineering experience. Alert, personable, seeks responsible and challenging position, using languages and real engineering, preferably abroad. Highly deferred in draft, have W.M.C. release. Me-876.

GRADUATE MECHANICAL ENGINEER, wide practical, and high technical experience, engineering and development work, medium and high-speed machinery. Eighteen years' with large midwestern manufacturer. Desires responsible position New York metropolitan area. Me-877.

POSITIONS AVAILABLE

SERVICE ENGINEERS, to 35, mechanical, either graduates or equivalent in experience in power work. Will be required to go into plants where new boiler equipment has been installed and start equipment working. Will also service old equipment. Must be familiar with boiler tests, etc. Men who have operated power plants for large companies or have had oil-refinery power-plant experience will be considered. Must be acquainted with high-pressure boilers. Company will train men. Seventy per cent of time will be spent traveling. $250 to $400 month dependent upon experience. Permanent. Headquarters, New York, N.Y. W-4443.

SALES MANAGER, mechanical-engineering degree or its equivalent, for sale of grinders and honing machines for industrial plants. $12,000–$15,000 a year. Midwest. Interviews, New York, N. Y. W-4478-C.

ENGINEER experienced in design and manufacture of electrical instruments and control devices for industrial and household applications. Permanent position with extremely interesting present and postwar prospects. $7200–$10,000 year according to capability. Write giving age, education, experience, references, salary required, and when available. Connecticut. W-4483.

ENGINEERS. (*a*) Product engineer. Work involves product design and quality control for arms and Augosan products. Will be required to produce design which could be readily manufactured at minimum cost and to produce complete set of detailed drawings for all of parts. Should have served as chief engineer of small company and/or assistant chief engineer of large company, and have experience on precision products such as firearms. Preferably having started on drafting board as designer. Salary $8000–$10,000 year. (*b*) Tool engineer. Must be experienced in tool designing and operation-sheet writing. Will be responsible for all operation layout sheets, design of jigs, fixtures, and tools and procurement of such equipment. Work also involves general supervision of toolrooms and control of storage and issuance of cutting tools. $8000–$10,000 year. Connecticut. W-4498.

EXECUTIVE AND GENERAL MANAGER to run small metal-manufacturing plant. Must be experienced in production, labor, and wage problems and have considerable engineering experience including supervision of machinery design. $10,000 year. Northern New Jersey. W-4511.

WORKS MANAGER, 40–50, graduate mechanical engineer, with 10 to 15 years' shop experience; able to estimate and hold down costs on nonrepetitive work, versed in methods and planning, and capable of co-ordinating and correlating work of engineering, production control, and manufacturing. Must have good mechanical background preferably with machine-tool experience. Salary open. Connecticut. W-4512.

PATENT ATTORNEYS, 25–40, with experience on compressors, pumps, ignition, fuel-injection pumps, etc. Permanent. $7200–$8620 year. Massachusetts. Interviews, New York, N. Y. W-4521.

DESIGN ENGINEER with experience on Bourdon spring pressure gages and instruments preferred. Permanent, excellent opportunity, and good salary. Write stating experience and education. New England. W-4536.

PLANT SUPERINTENDENT, 40 or over, with considerable practical experience for general machine job shop. Must be able to plan, meet production schedules, revise tooling and handle employee and labor relations. $7500 year. New York, N. Y. W-4538.

MANUFACTURING MANAGER for small plant manufacturing motors and motor generators. To $10,000 year. Ohio. Interviews, New York, N. Y. W-4539.

CHIEF ENGINEER of Division. Mechanical engineer experienced in design and construction of rock-crushing, cement plants, and the like. Considerable material-handling equipment. $6000–$10,000 year. Minnesota. W-4540-C.

TOOL DESIGNER AND CHIEF DRAFTSMAN to work directly under chief engineer in a progressive well-established photographic-equipment manufacturing concern now engaged in war work, but offering excellent opportunity for growth in connection with postwar products. $5200 a year to start. Connecticut. W-4548-R-2319-C.

TOOL AND DIE DESIGNER, mechanical, with some knowledge of machine design and experience in fabricating of light metals for design and layout of capping and closure equipment $5000–$6000 year. Pennsylvania. W-4553.

MECHANICAL ENGINEERING MANAGER for company manufacturing new postwar voice-recording machine. Will be required to keep manufacturing costs down, make purchases of equipment, and keep production going. Salary open. Maryland. W-4572.

DESIGNER, mechanical graduate, for tool design, estimating machining costs, and preparing quotations on ferrous and nonferrous precision items. $6000 year. Location, New York vicinity. W-4583.

MECHANICAL ENGINEER, graduate, 35–40, qualified to supervise boiler plant, purchase utilities, and supervise electrical maintenance department. Must have administrative ability. Ohio. W-4609-D.

[1] All men listed hold some form of A.S.M.E. membership.

Candidates for Membership and Transfer in the A.S.M.E.

THE application of each of the candidates listed below is to be voted on after December 16, 1944, provided no objection thereto is made before that date, and provided satisfactory replies have been received from the required number of references. Any member who has either comments or objections should write to the secretary of The American Society of Mechanical Engineers immediately.

KEY TO ABBREVIATIONS

Re = re-election; Rt = reinstatement; Rt & T = Reinstatement and Transfer to Member.

NEW APPLICATIONS

For Member, Associate, or Junior

AGERSTRAND, C. F., Muskegon, Mich.
ALLEN, R. K., Beechhurst, N. Y.
ARBUCKLE, L. L., Chicago, Ill.
BARNETT, S. W., Atlanta, Ga.
BEIER, PAUL H., Elizabeth, N. J. (Rt & T)
BERRY, GEORGE W. (SGT.), Asheville, N. C.
BIRD, FREDERICK H., Chicago, Ill.
BOYLE, W. E., Edwardsville, Ill.
CARVER, V. D., Oak Ridge, Tenn.
CHERNIAK, GEO. S., Boston, Mass.
COLESWORTHY, J. B., Los Angeles, Calif.
CONGDON, DONALD E., Barrington, R. I.
COOK, F. V., Tulsa, Okla.
COOPER, DELBERT J., Bartlesville, Okla.
DALEY, J. R., Portland, Oregon
DANA, BENTON P., Florence, Ala. (Rt)
DE HAVEN, IRVIN C., JR., Indianapolis, Ind. (Rt)
DE LA TORRE, LUIS G., Miami, Fla. (Rt & T)
DENNE, W. W. F., Sydney, Australia
D'OOGE, LEONARD (LIEUT.), Sacramento, Calif.
EKLUND, HENRIK, Wausau, Wis.
EMERSON, E., Cambridge, England
ENGELBACH, BYRON A., Walpole, Mass.
EVANS, M. C., Chicago, Ill.
FAATZ, E. D., Sidney, N. Y.
FALES, JAS. N. T., Franklin, Pa.
FARMER, WILLIAM C. (LIEUT. COL.), Aberdeen Proving Ground, Md.
FISHER, PHILIP S., JR. (LIEUT.), Philadelphia, Pa.
FOLEY, RAYMOND B., Detroit, Mich.
FRANZEN, PAUL R., Greensburg, Pa. (Rt)
FUHRO, ALFRED A., Jersey City, N. J.
GRAY, WM. T., Corning, N. Y.
GRIFFITH, EARL L., Short Hills, N. J.
GRUNDSTEIN, HERBERT, New York, N. Y.
HAMILTON, WILLIAM S. H., Larchmont, N. Y.
HARRISON, L. W., Newark, N. J.
HEINRICH, CHESTER J., Panama City, Fla.
HELMIG, RALPH, Chicago, Ill.
HERSCOVITCH, W., Victoria, Australia
HILL, GEO. W., New Orleans, La.
HILL, J. LAWRENCE, JR., Rochester, N. Y.
HODGE, J. FRED, Pittsburg, Kan.
HUGHES, DEAN G. G., Lafayette, La.
IPSEN, PETER G., Schenectady, N. Y.
IVES, CLIFFORD B., North Bergen, N. J.
KARCH, RICHARD G., Norwich, Conn.
KENNEY, CLARENCE E., West Allis, Wis.
KERR, WM. A., Snyder, N. Y.
KINDL, F. H., SR., Wilkinsburg, Pa.
KOFLAT, ALF, Chicago, Ill.
KOHN, DAVID F., Forest Hills, N. Y.
LA GRANT, ROY G., Bremerton, Wash.
LEVAN, AMBROSE E., Sellersville, Pa.
LONGMIRE, HARRY E., Detroit, Mich.
MACGREGOR, DAVID, Munster, Ind.
MANLEY, HUMES B., Kansas City, Mo.
MARTINEZ, JUAN J., Mexico, D. F., Mex. (Rt)
MCEWEN, EWEN (LIEUT. COL.), Huddersfield, England
MIELKE, CARL E., Pittsburgh, Pa.
MILLER, PAUL H., Berkley, Mich.
MILNE, GORDON R., Verona, N. J.
MITCHEL, A. H., Syracuse, N. Y. (Rt)
MITTMAN, CARL F., Kenmore, N. Y.
MURPHY, JOHN W., Nutley, N. J.
MYERS, MAURICE E., Portland, Oregon (Rt & T)
NARMORE, DEAN PHIL B., Atlanta, Ga.
NEWTON, JOHN S., Lansdowne, Pa.
NICHOLS, E. B., Moorestown, N. J. (Rt)
OWENS, F. R., Pittsburgh, Pa.
PAFFENBARGER, RALPH S., Columbus, Ohio
PARKER, JOHN, Collingdale, Pa.
PARRISH, WILLIAM C., Park Ridge, Ill.
PAXTON, ROBT., Philadelphia, Pa.
PEICKII, VASALIE L., Hollywood, Calif. (Rt & T)
PEPPER, R. HIAL, Hampton, Va. (Re)
PETERSON, VERNON E., Kansas City, Mo.
PHELPS, H. R., Detroit, Mich.
PRICE, WILLIAM S. (SGT.), Midway Park, N. C.
PURSELL, WM., Meriden, Conn. (Rt & T)
QUENTIN, CHARLES R., Schenectady, N. Y.
RAHLSON, ERICH A., Des Moines, Iowa
RALSTON, ALEX. H., Drexel Hill, Pa.
RAWBONE, K. K. (LIEUT.), Pietermaritzburg Natal, South Africa
RICHESON, W. L., New York, N. Y.
ROBINS, VERN T., Cabin Creek, W. Va.
ROBINSON, JOHN W., Chicago, Ill.
SARGENT, E. R., Ferguson, Mo.
SCHAUB, H. W., West Orange, N. J. (Rt & T)
SCHROEDER, RAYMOND V., Chicago, Ill.
SCOTT, F. WILLIAM, Washington, D. C.
SIGMUND, M., Newcastle-on-Tyne, England
SMALL, M. H., Chicago, Ill.
SODERBERG, STEIN, Nutley, N. J.
SPENCER, T. E., Cincinnati, Ohio
STASZESKY, FRANCIS M., Los Angeles, Calif.
STEERE, HARRY W., Chicago, Ill.
STEINER, EZEKIEL C., Los Angeles, Calif.
TESSMER, RAYMOND G., Tonawanda, N. Y.
THOMAS, FREDERICK A., St. John, N. B., Canada
VOGEL, LAWRENCE B., Morton, Pa.
WALLACE, EDW. G., Astoria, N. Y.
WHEELER, WM. A., JR., Bridgeport, Conn.
WILLIAMS, JARVIS, JR., New York, N. Y. (Rt)
WILLIAMS, R. ARTHUR, New York, N. Y. (Rt & T)
WOOD, J. LEONARD, New York, N. Y.

CHANGE OF GRADING

Transfers to Fellow

BUXTON, PAUL H., Alton, Ill.
LARKIN, DAVID, Kirkwood, Mo.

Transfers to Member

BANCE, E. S. (LIEUT.), Wanamassa, N. J.
BROWN, WM. J., Rochester, N. Y.
FERGUSON, DONALD M. (LIEUT.), Aberdeen Proving Ground, Md.
FULLERTON, HERBERT P., Buffalo, N. Y.
FULTON, HENRY R., Pittsburgh, Pa.
HASEGAWA, TATSUO, New York, N. Y.
HASKIN, J. ROBT., JR., Kirkwood, Mo.
HINNANT, CLARENCE H., JR. (MAJ.), Williamsport, Pa.
KELLER, EDWIN, Glassboro, N. J.
LESLIE, JOHN S., Ramsey, N. J.
LUDWICKSON, JAMES K., Lincoln, Neb.
MARICH, FREDK., New York, N. Y.
MCKENNEY, JAMES F., Amsterdam, N. Y.
NAYLOR, HENRY A., JR., Baltimore, Md.
RANDALL, R. D., Berkeley, Calif.
SELLERS, GEO. S., Berkeley, Calif.
SINCLAIR, LEO P. (LIEUT.), Arlington, Va.
SKINNER, JAMES C. (LIEUT. COL.) New Haven, Conn.
SKOGLUND, VICTOR J., San Diego, Calif.
TYLASKA, T. T., Houston, Tex.
VESELY, CHAS., Wauwatosa, Wis.
VOYSEY, ALFRED E., Watertown, Mass.
WALKER, A. G., Cuyahoga Falls, Ohio
WHITCOMB, ADRIAN H., Charleston, S. C.

A.S.M.E. Transactions for November, 1944

THE November, 1944, issue of Transactions of the A.S.M.E. contains:

An Investigation of Radial Rake Angles in Face Milling, by J. B. Armitage and A. O. Schmidt

Effect of Grain Size and Subzero Treatment on Productivity of Four High-Speed Steels, by S. M. Depoy

Machinability of Plain-Carbon, Alloy, and Austenitic (Nonmagnetic) Steels, and Its Relation to Yield-Stress Ratios When Tensile Strengths Are Similar, by E. J. Janitzky

The Influence of Through-Metal on the Heat Loss From Insulated Walls, by Victor Paschkis and M. P. Heisler

Formulas for Calculating the Temperature Distribution in Electrical Coils of General Rectangular Cross Section, by T. J. Higgins

Friction Factors for Pipe Flow, by L. F. Moody

Factors Affecting the Thickness of Coal-Ash Slag on Furnace-Wall Tubes, by W. T. Reid and P. Cohen

Draft-Gear Action in Train Service, by O. R. Wikander

Temperature Distribution Within Boiler Tubing Under Oblique Radiation, by W. S. Kimball

Ratio and Multiple-Fuel Controls in the Steel Industry, by Herbert Ziebolz

Necrology

ATWOOD, WILLIAM S., March 18, 1944
BRYANT, PERCY J., April 27, 1944
CHRISTIE, E. W., October 4, 1944
FERGUSON, DONALD, October 4, 1944
FORSYTHE, CLAYTON E., October 3, 1944
FRASER, THOS. T., September 2, 1944
HAYES, LESLIE D., October 1, 1944
WORTHINGTON, CHAS. C., October 21, 1944

• Keep Informed . . .

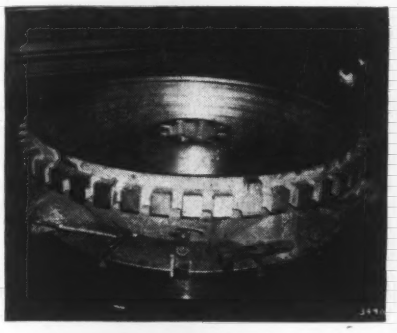
Announcements in this section are supplied by current advertisers in MECHANICAL ENGINEERING and A.S.M.E. MECHANICAL CATALOG. This section is restricted to these advertisers.

- *NEW EQUIPMENT*
- *BUSINESS CHANGES*
- *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

Giant Airplane Tire Mold Made of Meehanite



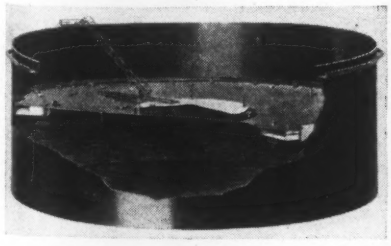
Farrel-Birmingham Co., Inc., Ansonia, Conn., has recently completed one of the largest tire molds ever made. The mold, which weighs a total of thirty tons, is now being used by a leading rubber company for producing 110" diameter tires. Each of these giant tires alone weighs 1800 pounds.

Process GM Meehanite was selected for this mold because of its superior physical properties, which give it high strength, close-grained structure and free machinability. In a mold such as this, the metal must be very close-grained with all surfaces absolutely free of imperfections, so that the rubber, after vulcanization, will have a smooth, even surface.

Made by the Randupson cement process of molding, each of the two fifteen-ton castings making up the mold were poured and all machine work done at the Ansonia plant of the company. After cleaning, the castings were heat treated to eliminate possible residual casting stresses.

New Wiggins Pontoon Roof Design

Chicago Bridge & Iron Co., 332 South Michigan Ave., Chicago, Ill. announces that the Wiggins Pontoon Roof has been completely modernized. The new design, known as the High Deck type, is shown in the cut-a-way illustration. It is furnished for all installations unless a previous used design is specified.



The principal changes embodied in the new design are improvements in the construction of the roof deck. There have been many refinements, however, in the seal.

The new seal is based on the original Wiggins principle of preventing the loss of vapor by using a shoe that forms a long sliding contact with the tank shell. Single shoes are standard on tanks with butt-welded shells. They are continuous bands of light weight flexible metal that fit close to the tank shell at all times and have only one reciprocating gap. The shoe is galvanized to reduce corrosion.

Secondary seals are supplied on all single shoe seals. They are fastened to the top of the shoe and rub gently against the tank shell, preventing wind currents from disturbing the air vapor mixture in the tall narrow slot between the shoe and the tank shell. The hangers that support the shoe and the mechanisms that hold it against the tank shell are also improved.

The outer pontoon is narrower but deeper than previously and is beneath instead of on top of the deck plating. On roofs over 60 ft. in diam. there is a circular pontoon on top of the deck plating at the center, which prevents water collecting there.

On the new design, the top of the deck has a continuous steep slope from the outer edge to the main drain, thus improving drainage. There are no flat areas or low spots where water and dirt might collect.

The amount of water that can collect, in an emergency, on the top of the deck when it is floating is considerably less than on previous designs. When the roof is resting on its supports, the slope of the roof is automatically adjusted to further reduce the amount of water it will hold.

New Features Announced in Foxboro Valvactor

New capabilities, as well as new convenience and sturdiness, are featured in a new Foxboro Vernier Valvactor, just announced by The Foxboro Co., Foxboro, Mass. The Foxboro Vernier Valvactor, familiar to users of control instruments in every field of industry, is a micro - positioner for pneumatic motor valves. It is used to insure precise and dependable valve response, especially where operating conditions may make the response uncertain, slow, or unsatisfactory. It is actuated by air pressure changes as slight as the equivalent of $\frac{1}{2}$ inch of water, and can compel valve stem movements as small as $\frac{1}{1000}$ of an inch.

Continuing the same operating principles which have made the Vernier Valvactor so successful in eight years of widespread use, the new construction involves a completely different arrangement of the actuating elements. New ease and range of adjustment, especially for duplexing and sequencing, and new snap action, for relay service or step sequencing of valves or damper motors, are provided by new, convenient zero and range adjustments. New ease of reversal is provided, without change of parts or piping.

The new unit retains the outstanding advantage of relay action. Flexure type bearings, in place of pivots, eliminate the effects of mechanical vibration, without loss of sensitivity. Finally, although the Vernier Valvactor retains the same general external appearance, new ruggedness has been provided for it by a heavier metal case. Complete specifications of the new type unit will be furnished by The Foxboro Company on request.

Large Refrigerating Machine Goes To War

A large refrigerating machine that has helped Marshall Field & Co.'s customers to shop in cool comfort, has gone to war. One of the two Carrier Centrifugal Refrigerating Machines of 500-ton cooling capacity is now helping to speed up the production of synthetic rubber treads for tanks at the Inland Division of General Motors at Dayton, Ohio.

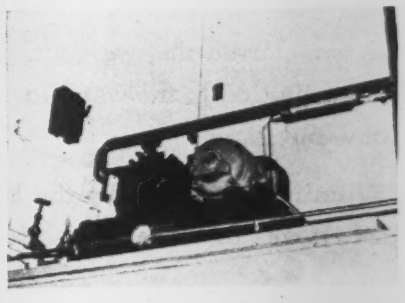
At the Chicago Store the machine chilled water to cool the air for the basement of the main building; the Store for Men, and other smaller departments throughout the main store. In its new war work, the Carrier machine will be used for cooling the processing rolls in the manufacture of synthetic rubber for war use.

"Loss of the Carrier Refrigerating Machine still left 50% of our original cooling capacity," according to the management.

Refrigeration Equipment Serves in Production of Aluminum Aircraft Parts

How refrigeration equipment serves in the production of aluminum aircraft parts at the Santa Monica plant of Douglas Aircraft Co. was told recently by an official of the company, which has installed Carrier refrigeration equipment in the Santa Monica plant.

Temperature, it is explained, is the principal factor in strengthening the comparatively soft aluminum alloy so it will become virtually as hard as steel and will stand up under the stern test demanded in Douglas bombers and cargo planes.



The aluminum alloy, in the shape of various aircraft parts, is first brought into the big heat-treat room at Douglas and plunged into a tank containing a solution of nitrate salt at 950° F. After a relatively brief period in the nitrate heat bath, the alloy is whisked into the air and immersed in a water quench tank which is kept at 42° to 45° by Carrier refrigeration equipment. The tank measures 4 × 20 × 6 feet and has a capacity of 3,500 gallons.

The quick dash into the water quench tank is necessary as a "delayed" quench causes

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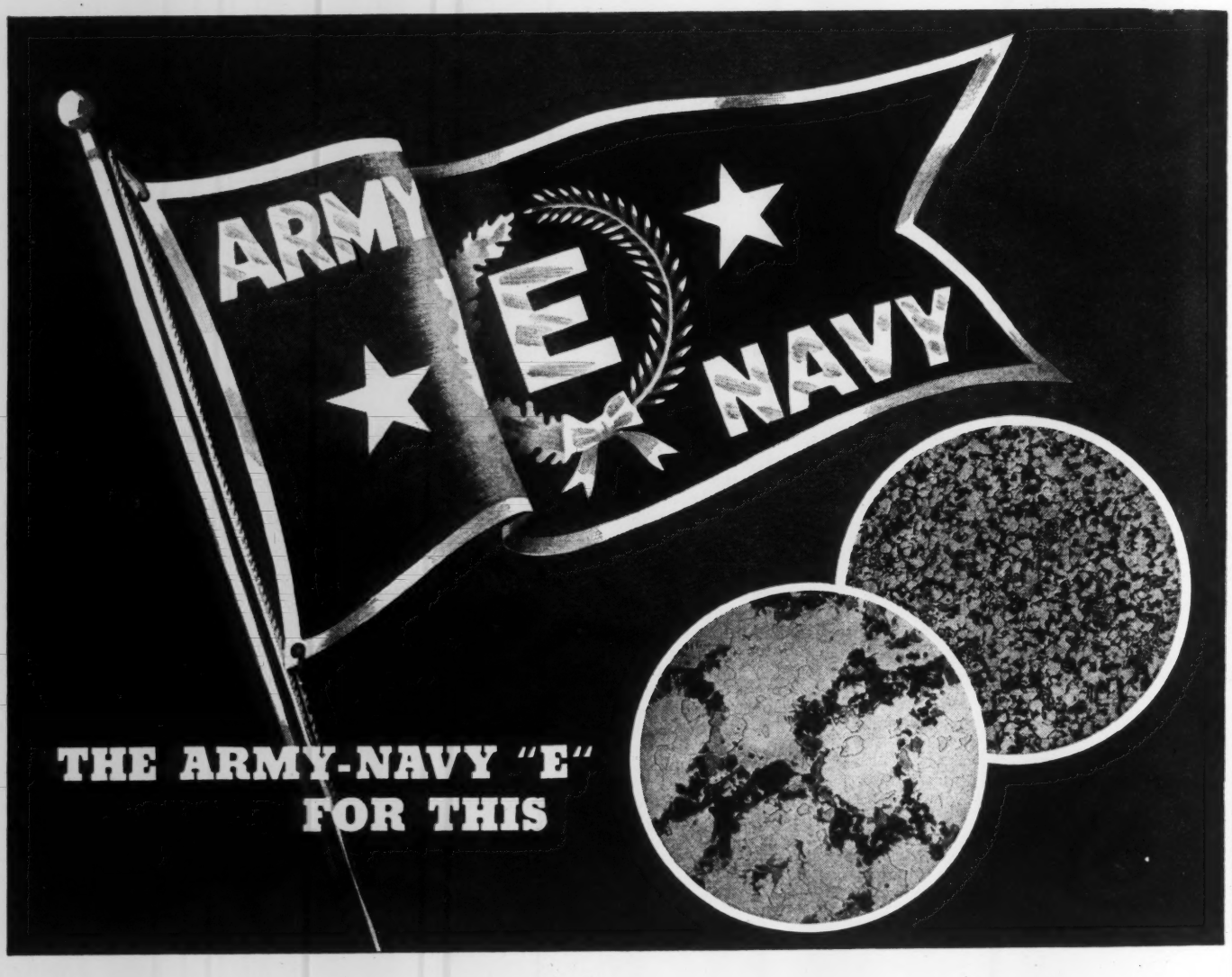


On September 5th, 1942, our Mine and Mill at Climax, our Research Laboratory at Detroit and our Conversion Plant at Langeloth, Pennsylvania, were given the Army-Navy Production Award. Since then the award has been twice renewed. The two-starred flag we fly represents a full year of contribution to the war effort recognized by the Army and Navy.

Winning the award by the laboratory began in 1931. It was then that it was founded to meet our needs for authoritative information about molybdenum—containing ferrous materials.

Pearl Harbor intensified our work with producers of war equipment—work that is aided considerably by the accumulated data and experience gained in over ten years of concentrated research.

We are particularly proud to be among those companies whose laboratories are entitled to fly the Army-Navy "E".

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue · New York City

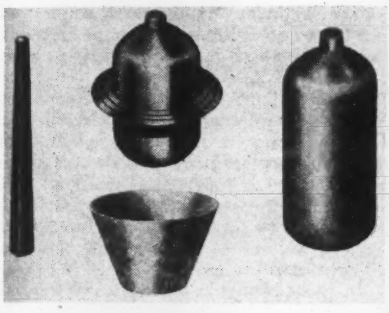
MOLY

grain segregation, with subsequent corrosion and weakening of the metal.

Following emergence in another tank, if not needed for immediate stamping, the material is stored at 10° F. in order to retain its annealed state for stamping or extruding at a later date. Otherwise hardening would set in within two hours and the anneal lost completely in three days. Aluminum parts are held in storage for as long as thirty days. The cold storage room is held at proper temperature by Carrier refrigeration equipment.

Cold Drawing Solves Manufacturing Problems

Of special interest to development and design engineers is the recent advancement in cold drawing of high-strength alloy steels, which has been accomplished, by the close cooperation of metallurgical engineers, steel makers, and fabricators.



The cold drawing of high-strength alloy steels has resulted in saving thousands of tons of critical alloys, employing chromium, nickel, molybdenum, etc. It was fortunate that this development was carried on prior to the entry of the United States into the present conflict. Not only has cold drawing resulted in saving of great quantities of these critical materials, but many machine tools and skilled machinists have been released for other important work.

One good example is the manufacture of high-pressure light-weight type cylinders used for storage of carbon-dioxide gas for the inflation of rubber rafts which have received so much publicity in recent months. Also, light-weight type cylinders used in aircraft for storage of aviators' breathing oxygen for high altitude flying. These cylinders must, of necessity, be light in weight and yet, must be suitable for working pressures of 1800 lbs. to 2015 lbs. per sq. in. To obtain the necessary light weight, high-strength alloy steels are used in their manufacture. Formerly, these cylinders were made from an alloy steel forging. Before closing the open end of this forging to form a seamless cylinder, the forging was machined internally and externally to remove excess material and to meet the maximum weight specification. This forging had a tare weight of approximately three times the weight of the finished cylinder. By the cold drawing process, the cylinder is now cold drawn to proper side-wall thickness and the amount of alloy steel required to make the cylinder is reduced from 50% to 60%.

The cold drawing of metals into deep, seamless shells is not new. This process, frequently referred to as the Hackney process, has been used by the Pressed Steel Tank Co. of Milwaukee, Wis., for over forty years. Hackney engineers applied these years of experience in the deep drawing of various metals to develop these light-weight high-pressure cylinders.

Continued on page 22

Now . .

and in the Peace to Come

Just as McGILL "Solidend" *MULTIROL* Bearings have been and are a part of the greatest effort American Industry has ever made, so will they have an important part in rebuilding the civilian economy. Industry has learned things during the speed-up. Old standards have of necessity been replaced with new and better ways. And McGILL "Solidend" *MULTIROL* Bearings, with their greater load capacity and provision for incidental thrust, have proved themselves to be the bearing of tomorrow. They cut operating and maintenance costs and give greater bearing performance.

For complete information regarding McGILL "Solidend" *MULTIROL* Bearings, send for bulletin SM-42.

BEARING DIVISION 1100 N. Lafayette Street

McGILL MANUFACTURING COMPANY, INC.

VALPARAISO · INDIANA

The Hackney cold drawn process consists of cupping from flat circular sheets or plates, cold drawing to obtain desired diameter and wall thickness, with necessary heat treatment to obtain required physical characteristics in the finished product. Careful control of tolerances of the dies and mandrels assure uniform side-wall thickness and produce a smooth, cold-drawn finish. By this process it is possible, in many instances, to eliminate machining. There are several other good examples such as a seamless cylinder housing for actuating pistons which employ leather cups or packing for the sealing medium. Another application in which machining was eliminated was the use of a seamless cold-drawn, high-strength alloy piece of tubing as an oleo strut sleeve, which is part of a landing gear mechanism on certain types of aircraft.

In the aircraft field, another example of the elimination of costly machining is the use of a seamless, cold drawn, hydraulic accumulator housing. By this manufacturing process and the use of high strength alloy materials, the accumulator housing meets the working pressure requirements and the maximum weight specifications and tolerances without machining. Previously, it was necessary to manufacture these accumulator housings from high strength alloy forgings which were machined to meet weight specifications.

There are numerous other applications where the cold working of various metals has solved manufacturing problems, reduced costs, saved materials and has enhanced the appearance of the completed unit. The cold drawing of metals has had a prominent place in industry for years but there are, no doubt, manufacturing problems that lie ahead, many of which will be solved by the experience already gained through the cold drawing of various metals.

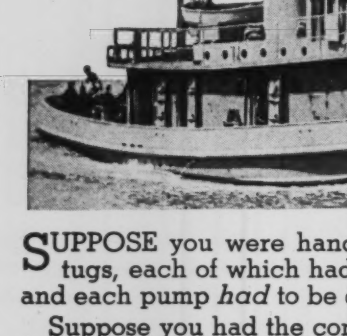
IF YOU WANTED A LOT OF PUMPS FOR SPECIFIC JOBS...IN A HURRY ...WHERE WOULD YOU GO?

Write, stating the type of work you are engaged in, and Goulds will forward you a complete set of literature illustrating and describing the Goulds Pumps that have been developed specifically for your industry. Goulds Pumps are available, if you have a suitable priority rating.

SUPPOSE you were handed the orders for a whole fleet of coastwise tugs, each of which had to be equipped with half a dozen pumps . . . and each pump *had* to be designed for the job it was to do?

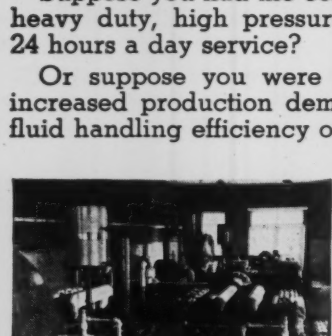
Suppose you had the contract for an oil pipe line with a dozen or more heavy duty, high pressure pumps able to stand up under continuous 24 hours a day service?

Or suppose you were completely re-equipping your plant to meet increased production demands and your whole process hinged on the fluid handling efficiency of your pumping system?



Where could you go where you would be sure of getting *the* pumps that were designed to do those specific jobs? Where could you go where you could get any or all of these pumps from the *one source?*

Goulds has the answer to that . . . as it had in the actual cases mentioned here. Out of 96 years of exclusive specialization on pumps and pumping problems Goulds has developed a complete line of pumps designed to meet any pumping requirements, large or small. Because no one pump, nor any one type of pumping equipment, is suitable for all purposes, Goulds, as pump specialists, offer a complete line of reciprocating, rotary and centrifugal pumps in all sizes and capacities, out of which can be selected *the* pump for *the* job.



Goulds
PUMPS INC.
SENECA FALLS, N. Y.

Open Steel Decking for Bridges

Thousands of small county bridges can be salvaged by new floor surfaces, F. H. Frankland, director of engineering of the American Institute of Steel Construction, said today. Such an economical modernization might "increase their life expectancy as much as 10 to 20 years," he declared.

Of the tens of thousands of such bridges throughout the country "thousands are obsolete in respect to floor systems," Mr. Frankland said. "They are inadequate for modern highway loadings. Stringers and floor beams often are in bad shape. And the poor flooring of many frequently causes accidents."

Mr. Frankland attributed these conditions to "lack of maintenance and modern design." He said that, in many cases, the most economical replacement of floor surfaces for bridges would be open steel decking. This type of flooring was first developed by the Irving Subway Grating Co. of Long Island City, N. Y., and is now used on more than 500 American bridges.

"In those countries where heavy snowfalls occur," Mr. Frankland pointed out, "this type of flooring would be particularly desirable."

Open steel decking does not accumulate snow or ice, thus eliminating the possibility of skidding, and is extremely light in weight, thereby reducing the dead load on the trusses of old bridges so that they may be widened or restored to the adequacy of modern heavy traffic.

War Invention May Provide Floating Rides for Trains and Autos

Servo-mechanism principles that enable American tanks to fire on the run with such devastating effect quite possibly will provide "floating" rides in high-speed trains and other vehicles, according to Westinghouse engineers. Actual development work on these applications has been started. Calculations show that the power required to stabilize the vertical movement of a railroad coach is only about three horsepower. The mechanism necessary to accomplish this is small enough to fit into an over-night bag. Curiously enough the servo-mechanism to stabilize a railroad car will require about the same power and be about the same size as that required for an automobile. Here is the explanation: The equipment required depends on the weight of the object multiplied by the square of the up and down movement of the road. The automobile is much lighter, but the vertical movement is several times that experienced by a railroad car.

New Slide Rules Now Available

The Frederick Post Co. of Chicago has recently announced the availability of three new slide rules—one for the professional draftsman, one for the apprentice draftsman or student and also a handy five-inch pocket slide rule.

All three of the rules contain the scales A, B, C, D, CI, K, S, L and T. With exception of the apprentice rule they are celluloid faced—the apprentice rule has a painted face.

These rules have been produced as an emergency measure to meet the tremendous

• Keep Informed . . .

demand. They are well constructed, accurate slide rules and come equipped with a case and instruction sheet on the complete operation of the slide rule.

Engineering, drafting, accounting, estimating and sales departments will more than welcome this news of the availability of slide rules.

For further details and information just write the Frederick Post Co., Box 803, Chicago 90, Illinois.

Meets the Need for Photo-Exact Copies Quickly

Frequently there is need for photo-exact copies of letters, court decisions, new rulings, receipts and contracts—for copies of blueprints for which tracings are not available or copies of pencil-sketched diagrams when there is no time to trace them in the usual manner.

One or a hundred copies can now be made quickly, at low cost, by any employee and without a darkroom. The A-PE-CO Photo-Copyer is a newly developed, photo-processed means of copying anything written, typed, printed, drawn or photographed, using specially prepared photo paper and inexpensive equipment that can be operated on any desk or table.

Copies are made in faithful detail up to 18 x 22 inches in the exact size as the original. So accurate and clear are these photo-copies that they are accepted as legal evidence. They are non-fading; therefore they are usable, permanent records and permit keeping important originals in a safe place.

The uses of the A-PE-CO Photo-Copyer are seemingly endless. Frequently the saving in typing alone soon repays the low cost of the A-PE-CO equipment. Certainly, in providing usable photo-exact copies of important papers, therefore safeguarding the originals, the A-PE-CO equipment is worth many times its nominal cost.

Complete information about the A-PE-CO Photo-Copyer and the many savings it makes possible may be obtained from the manufacturer: American Photocopy Equipment Co., 2849 N. Clark St., Dept. 274, Chicago, Ill.

New A-C Self-Priming Pump

An improved automatically controlled valve is a distinctive feature of the new Type AO self-priming pump announced by Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin. The design and operation of its valve arrangement is an important factor in the quick and effective self-priming action of this pump.

Priming of the Type AO pump is accomplished as the motion of the water throughout the pump runner and the volute passage carries behind it a slug of air, drawing air in the suction passage through the impeller and out through the priming chamber. This hydraulic action lifts the column of water in the suction line and achieves the same results as would a separate vacuum pump. The priming valve closes slowly during this process, acting against a spring tension which governs the rate of priming and the static height of the priming suction lift. The automatic closing of the valve after complete priming prevents water from bypassing back to the suction chamber, with resultant power loss.

The pump impeller has an unusually thick vane with rounded inlet edges, permitting the pump to pass stringy materials and fairly large solids.

Allis-Chalmers plans a complete line of the self-priming Type AO pump, from 1 to 6 inch size, although only 2 inch and 3 inch sizes are ready for immediate sale. The entire line of pumps will range from a very small capacity to 1400 gpm and up to heads of 100 feet or over. The self priming device incorporated in these pumps is also adaptable to use with other pumps, particularly the single suction type. Further details may be obtained by writing the manufacturer.

New Packing List Protector Replaces Critical Materials

A new-type Packing List Protector, fabricated from asphalt plyboard has been developed by The Philip Carey Mfg. Co. and is distributed nationally by the Western Paper Goods Co. of Cincinnati, Ohio, manufacturers of waterproof envelopes. According to a statement by Mr. G. B. Johnston, Manager of the Carey Marketing Division, the new protectors efficiently replace such critical materials as metal and plywood, at a fraction of their cost.

Mr. Johnston reports that shippers of crated and cased materials, both in the export and domestic fields, are enthusiastically accepting the new Covers, the successful performance of which is indicated by their present use which runs in the millions.

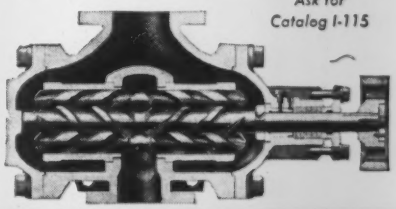
These new covers are available in three sizes—6″ × 8″, 8″ × 11″, and 10½″ × 13″. They are adequately dished to take bulky packing lists, assembly instructions, etc., and are firmly affixed to the outside of the crates or boxes through pre-punched nail starters.

This item is now in extensive use by the Ordnance Dept., Quartermaster Corps, Air Corps, Medical Corps, Office of Chief of Transportation and leading shippers all over the country.

Continued on page 24

The reliability of IMO "lube" and fuel oil service pumps is typified by their trouble-free performance on a United States Destroyer reported to us by the Navy as having steamed over 84,000 miles on convoy duty during the past year, often cruising as much as 28 days per month without time for normal upkeep and overhaul.

Ask for Catalog I-115



IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton 2, New Jersey

PUTTING A NEW "HEX" ON PRODUCTION PROBLEMS

The ROL-TOP "hex" nut is a new application of the Boots principle of self-locking nuts which assure vibration-proof connections.

Because of the recognized efficiency of the ROL-TOP, design engineers are specifying it for application wherever self-locking devices are desirable.

Specially planned and built for heavy duty, the ROL-TOP Nut resists heat, air, gasoline and other destructive elements which make ordinary non-metallic devices inapplicable.

Boots one-piece, all-metal, self-locking nuts pass all government requirements.

SEND FOR CATALOGUE

BOOTS

BOOTS AIRCRAFT NUT CORPORATION ★ GENERAL OFFICES, NEW CANAAN, CONNECTICUT

The new covers are furnished in the natural black asphalt color, and also in the complete range of colors required by the various Service Branches, such as Quartermaster Green, Air Corps Blue, etc.—thus readily identifying the Branch of the Service to which the shipment belongs.

As no critical materials are involved, prompt shipment can be secured on virtually any quantity.

Westinghouse to Expand Air Conditioning Activities

To prepare for post-war expansion of air conditioning activities, the Westinghouse Electric & Manufacturing Co. has announced the transfer of all heavy duty air conditioning and industrial refrigeration manufacture from its East Springfield, Mass. Works to the Jersey City, N. J., plant of the Westinghouse Electric Elevator Co.

"We believe that air conditioning will become a more important industry in post-war America, and it is our intention that Westinghouse shall continue as one of the major producers in the field," said George H. Bucher, President.

An important reason for making this move at this time, according to Mr. Bucher, is to release space for the present vital war work at the East Springfield Works of the Appliance Division. At the same time the accommodation of air conditioning manufacture at the Elevator Company will not interfere with the current war production at that plant. Industry has learned during this war, as never before, the advantages of air conditioning to increase efficiency, production and quality. The millions of workers who have enjoyed its benefits are going to want those same benefits in their homes. These and other factors indicate to us that the air conditioning industry is about to come into its own.

Simultaneously, Frank C. Reed, Vice President of Westinghouse and President of Westinghouse Electric Elevator Co., announced the appointment of Ross Rathbun as manager of air conditioning, and of Walker G. White to succeed Mr. Rathbun as general sales manager of the Elevator Company. The Elevator Company, for its production of elevators, gun mounts and other heavy items of war equipment, was one of the first companies in America to receive the Army-Navy "E" pennant, to which was recently added its third star for continued excellence of performance.

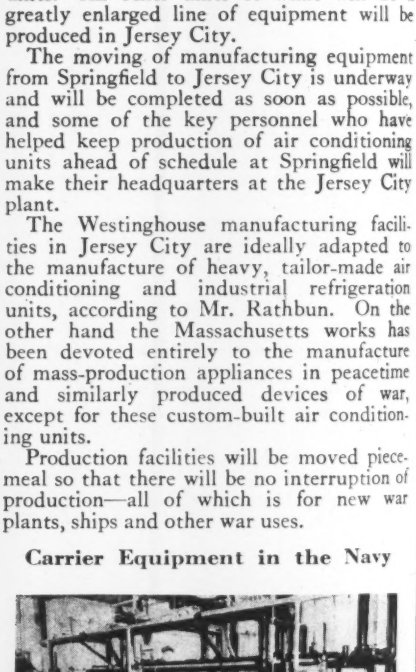
Springfield will continue to manufacture lighter air conditioning, commercial refrigeration units and household refrigerator units. All other units of what will be a greatly enlarged line of equipment will be produced in Jersey City.

The moving of manufacturing equipment from Springfield to Jersey City is underway and will be completed as soon as possible, and some of the key personnel who have helped keep production of air conditioning units ahead of schedule at Springfield will make their headquarters at the Jersey City plant.

The Westinghouse manufacturing facilities in Jersey City are ideally adapted to the manufacture of heavy, tailor-made air conditioning and industrial refrigeration units, according to Mr. Rathbun. On the other hand the Massachusetts works has been devoted entirely to the manufacture of mass-production appliances in peacetime and similarly produced devices of war, except for these custom-built air conditioning units.

Production facilities will be moved piecemeal so that there will be no interruption of production—all of which is for new war plants, ships and other war uses.

Carrier Equipment in the Navy



Carrier refrigerating equipment installed at a Navy Air Station assures fresh food for the large number of Navy personnel stationed there. Carrier refrigerating machines also serve the bakery to hold dough at 40° temperature until time for its baking.

Wanted—100 Users of Transparent Prints (Ammonia Process)

To reduce the time element between the pilot stage and large scale production of a badly needed product The Frederick Post Co. wants 100 users of Transparent Ammonia developed prints to confirm or disprove the laboratory and limited field tests

FRASER-BRACE ENGINEERING CO., Inc.

Design, construction and installation of complete plants and projects

Mechanical, Heavy Industries, Shipbuilding, Hydro-Electric Developments, Power Plants, Chemical and Refining Plants, Process Industries, Metallurgical Developments and Processes, Explosives, Plastics, Water Supply and Treatment, Sewage and Industrial Wastes Treatment.

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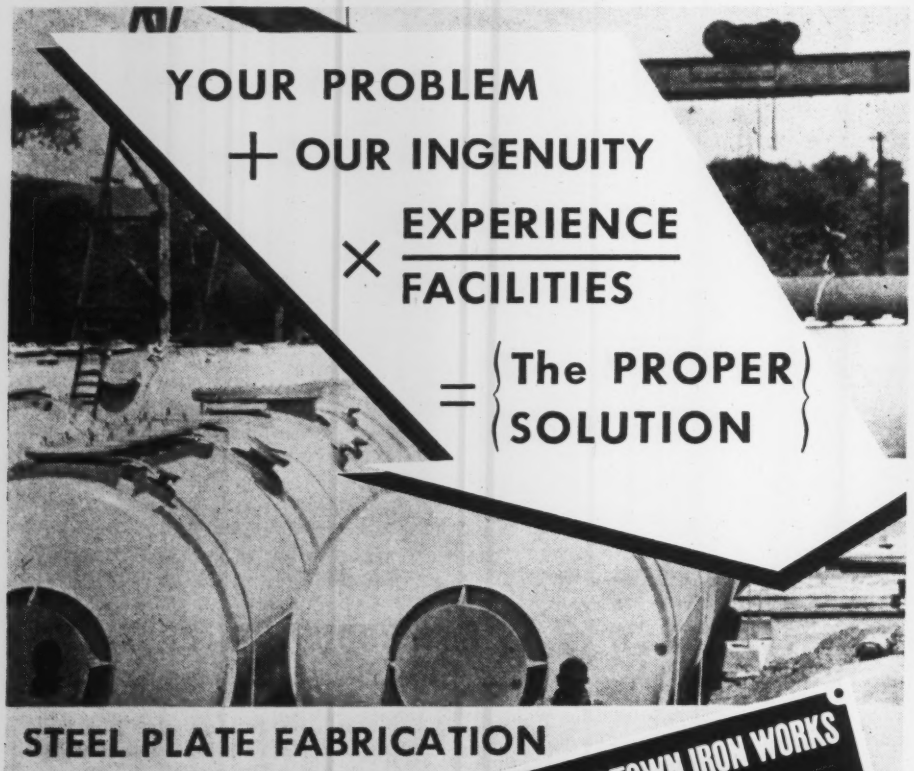


STEEL PLATE FABRICATION

SILICON BRONZE STAINLESS-CLAD STEEL
NICKEL CLAD STEEL • MONEL • PURE NICKEL • CHROME NICKEL ALLOYS • CARBON STEEL • CHROME IRON

DOWNINGTOWN IRON WORKS
DOWNINGTOWN, PA.
WELDED and RIVETED PRODUCTS

• Keep Informed

of what appears to be a full step forward in this field.

The new Transparent, ammonia process, VAPO-vel has just passed months of testing for fading, keeping quality, stability of image and background, printing and developing speed, sharpness of image and the ability to pick up both strong and delicate detail.

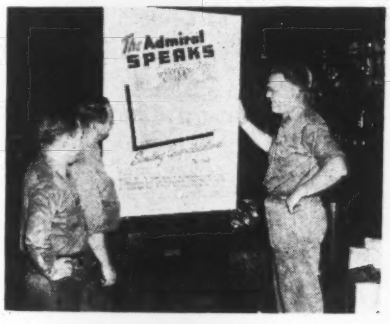
Trial quantities will be furnished without charge with the understanding that a detail report will be made on the results of the tests.

If the comprehensive reports are favorable the original production facilities will be available to the one hundred companies participating in the tests.

For those who wish to make these tests just write the Frederick Post Co., Box 803, Chicago 90, Ill.

Navy Chief Thanks Foote Bros. Workers

An active program to stimulate workers to increased effort has been developed by Foote Bros. Gear and Machine Corp. of Chicago. Part of this program includes shop posters telling how Foote Bros.' products are serving the Army and Navy.



Recently Rear Admiral E. L. Cochrane USN Bureau of Ships sent a telegram to the men and women of Foote Bros. notifying them of the active part the gears they are making are playing in Naval action.

The telegram was used as a part of the poster campaign to inspire Foote Bros. employees.

Above from left to right Clinton F. Harris, foreman in the Milling Department, Charles Posta, lathe operator, chief absentee sentinel, and Elmer Holmes, vertical boring operator and member of the Safety Committee, are shown preparing the poster for display.

Army-Navy "E" Awarded to York Corporation

The Army-Navy "E" for outstanding achievement in the production of air conditioning and refrigeration for war has been awarded to the York Corp. of York, Pa., at special ceremonies attended by more than 5,000 war workers and their families.

In presenting the award, Brigadier General H. F. Safford, Chief of the Production Service Branch of the Army Ordnance Department, warned Americans they are making a tragic error if they count on the sudden collapse of their powerful German and Japanese enemies. He declared that instilling over-optimism to cause a slackening in our production efforts is part of a cunning propaganda campaign being waged by the Axis.

W. S. Shipley, Chairman of the Board of York acted as chairman of ceremonies and S. E. Lauer, President, formally accepted the "E" pennant. Other speakers were Lieutenant Commander B. P. Edmunds, U.S.N.R., Chief of Priorities Section, Fourth Naval

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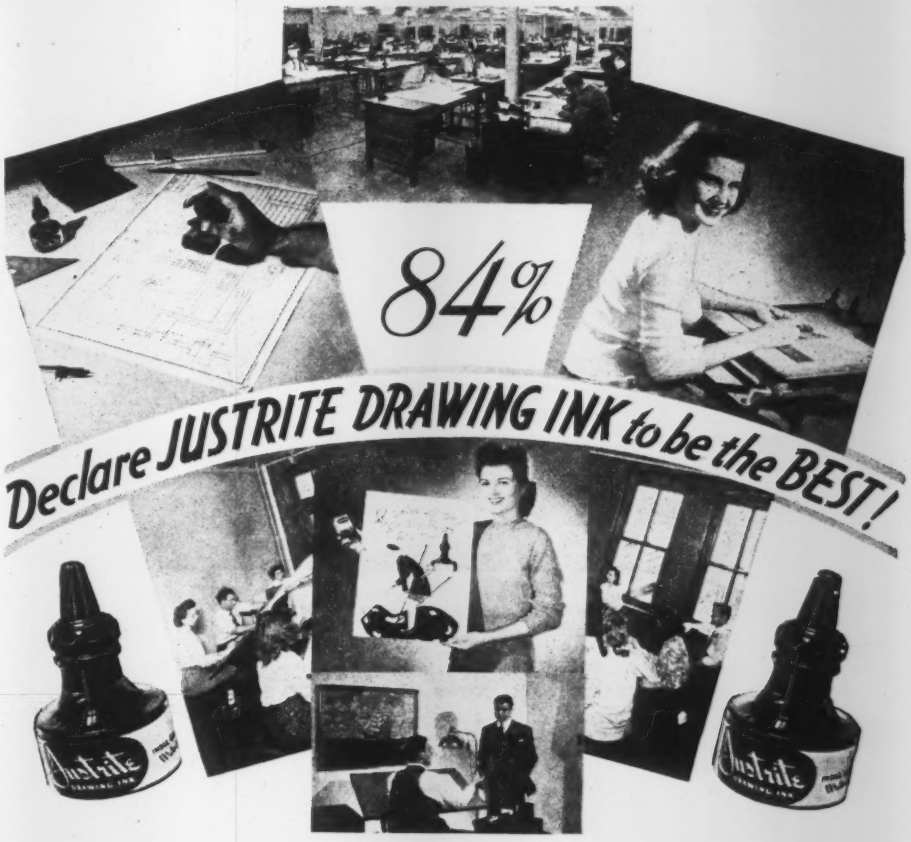


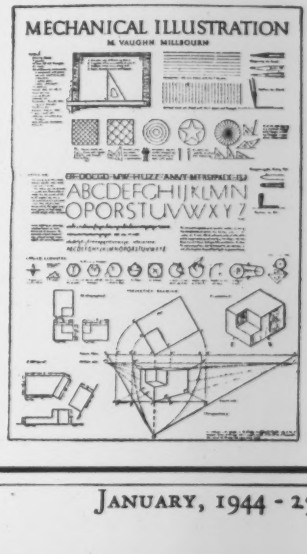
A questionnaire was recently sent to 975 users of drawing ink. Of the 351 replies received, 297 stated that they "found Justrite superior to other drawing inks they had used." Thirty-two stated that Justrite was "as good as any." Thirteen decided that Justrite was not superior to others, and nine did not answer the question. Here is a breakdown by the class of user:

	Justrite Drawing Ink was Superior to Others	As Good As	Not Superior	No. Answer
Instructors	131 (85%)	16	4	4
Draftsmen	125 (86%)	10	6	4
Artists	41 (80%)	6	3	1

While over 84% declared it was the best, over 95% of all those replying said that they were going to continue to buy it. If you haven't tried Justrite Drawing Ink as yet, maybe you're missing something!

FREE! Large Wall Chart of Mechanical Illustrations

This giant 23x35 inch chart shows many of the elementary steps in mechanical drawing, lettering, applied geometry, and perspective drawing. Write today on your letterhead. Please mention, also, your drawing ink dealer's name.



For Your Free Chart
Write Dept. BF
LOUIS MELIND COMPANY
362 W. Chicago Ave., Chicago 10, Ill.

District of Philadelphia, and Curtis L. Warner, President of the Ice Machinery Independent Employees Association. No formal dinner was held following the ceremony. Instead, the Company computed the amount which would have been spent and donated it to the local branch of the National War Fund.

In addition to its regular production of refrigeration and air conditioning for military and industrial applications, York is also devoting 25 per cent of its manufacturing facilities to direct ordnance. The Company is now building reciprocating steam engines for the new destroyer-escort vessels, engine castings for Liberty ships, aircraft parts, welded tank hulls and tank gun mounts, coastal defense artillery carriages and a wide range of similar equipment. It is also responsible for the development of the modern stratochamber which simulates both temperature and air pressure of altitudes up to nine miles. These chambers are now an indispensable part of aviation testing.

Farrel-Birmingham Awarded Third Renewal of Navy "E"

Among the first to receive the Navy "E" early in 1942, Farrel-Birmingham Co., Inc., manufacturers of marine gear drives for Navy and Maritime Commission vessels as well as heavy machinery for the steel, metal-working, rubber, plastics, paper and sugar industries, has received its third renewal for continued excellence in the production of equipment for the Navy.

In his letter announcing the renewal of the award Admiral C. C. Bloch, USN (Ret.), Chairman of the Navy Board for Production Awards, said in part:

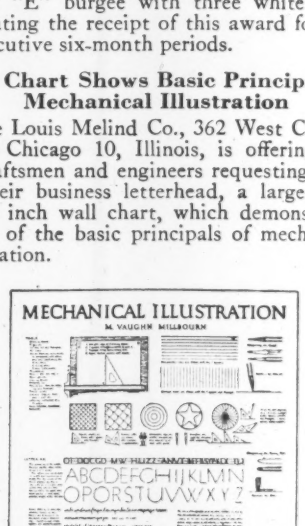
"The men and women of your plants have continued to maintain the high standards they set for themselves when they were originally awarded the Navy "E." They may well be proud of their achievements.

"The additional white star which the renewal adds to your Navy "E" award flags is the symbol of appreciation from our armed forces for your continued and determined effort and support so necessary for victory."

Each of the company's three plants, located at Ansonia and Derby, Conn., and Buffalo, N. Y., is now privileged to fly the Navy "E" burgee with three white stars, indicating the receipt of this award for four consecutive six-month periods.

Wall Chart Shows Basic Principals of Mechanical Illustration

The Louis Melind Co., 362 West Chicago Ave., Chicago 10, Illinois, is offering free to draftsmen and engineers requesting same on their business letterhead, a large 22½ × 35 inch wall chart, which demonstrates many of the basic principals of mechanical illustration.



The chart was drawn in Justrite Drawing Ink by M. Vaughn Millbourn.

Mr. Millbourn is an instructor at the Chicago Academy of Fine Arts, one of the 27 Designers' Group of Chicago, and is a past president of the Society of Typographic Arts, and of the Chicago Free Lance Artists Guild.

Westinghouse Plants Earn Second "E" Renewals

Nine Westinghouse plants have received renewals of their Army-Navy "E" awards, it was announced recently by George H. Bucher, President of the Westinghouse Electric & Manufacturing Co.

As a result, eight of the plants are now permitted to fly the "E" burgee with two white stars, indicating the second renewal of their awards for excellence in production. In addition, the Westinghouse Electric Elevator Co. plant at Jersey City, N. J., will fly an "E" burgee with four stars, marking the fourth renewal of its production award.

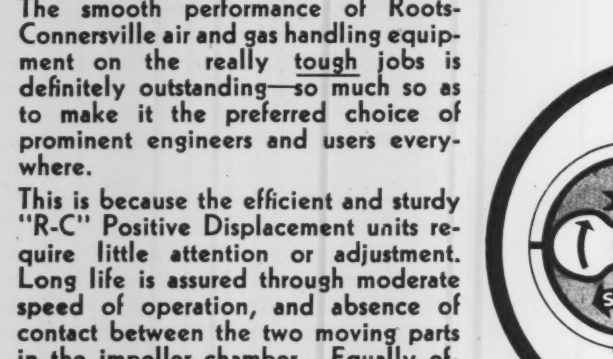
The other plants honored were those at East Pittsburgh, Trafford, Derry and Nuttall, Pa.; the Transformer Division, Sharon, Pa.; the Steam Division, South Philadelphia, Pa.; the Philadelphia Manufacturing and

RELIABILITY *under tough operating conditions ---*

The smooth performance of Roots-Connersville air and gas handling equipment on the really tough jobs is definitely outstanding—so much so as to make it the preferred choice of prominent engineers and users everywhere.

This is because the efficient and sturdy "R-C" Positive Displacement units require little attention or adjustment. Long life is assured through moderate speed of operation, and absence of contact between the two moving parts in the impeller chamber. Equally effective on pressure or suction service. Write for literature.

ROOTS-CONNERSVILLE BLOWER CORP.
401 Washington Ave., Connersville, Ind.



POSITIVE DISPLACEMENT

The principle is simple and effective. Twin impellers, mounted on parallel shafts, are rotated in opposite directions by a pair of gears. Each impeller alternately sucks in, momentarily entraps, and then expels a definitely measured amount of air or gas, resulting in the delivery of four equal pre-determined volumes each revolution. Capacity varies with the speed. Pressure is automatically built up to overcome resistance on discharge side. No internal lubrication.

"R-C" Blower installed on coal cleaning equipment in Ohio mine. Capacity 1400 c.f.m., 491 r.p.m., 2½ lbs. pressure.

BUY WAR BONDS.....GIVE BLOOD

Roots CONNERSVILLE SINCE 1854 Rotary Positive BLOWERS

• Keep Informed

Repair plant; and the Newark, N. J., Manufacturing and Repair plant.

Second renewals of the award indicate that high war production records have been maintained for more than a year since the red, white and blue banner was first presented to the plants.

In a letter to Mr. Bucher, Admiral C. C. Bloch, chairman of the Navy Board for Production Awards, congratulated Westinghouse employes for their continued splendid production in such volume as to justify this renewal of their award.

Chiksan Tool Co. Awarded Army-Navy "E"

Chiksan Tool Co., Brea, California, was awarded the Army-Navy "E" Pennant for excellence in war production at formal ceremonies at the Chiksan Plant on Friday, November 19th. Presentation of the Army-Navy "E" Pennant was made by Rear Admiral J. R. Defrees, U.S.N. (Ret.). W. Edgar Spear, president of Chiksan, accepted the award in behalf of all Chiksan Employees. "E" pins were presented by Lieut. Col. Henry E. Beal, U.S.A., and accepted by Van J. Kubin, oldest Chiksan employee. Chiksan manufactures swing joints and oil tools.

Air Conditioning in a Carpet Mill

How American resourcefulness and ingenuity were applied to permit a carpet mill to switch over quickly to the manufacture of cotton duck for the government was told recently by officials of the Magee Carpet Company, Bloomsburg, Pennsylvania. The story is one of cooperation between the Company and air conditioning engineers in breaking what appeared to be an almost insuperable bottleneck.

Before the war, the Magee Carpet Company worked primarily with wool. When war came, their looms were set up to make cotton duck for the Army, but difficulties were encountered with weather changes because the weave room was not equipped with humidity control. The weaving of cotton called for high humdity air and constant humidity control. It appeared that the required humidifying equipment would not be available under wartime restrictions, but the operating difficulties demanded an immediate solution to the problem.

Engineers of the Power Engineering Corporation, Wilkes Barre, Pennsylvania, Carrier Corporation distributors, learned of a silk mill in Philadelphia which contained Carrier humidifying equipment and which had been closed down when silk became scarce. A check-up revealed that the equipment, although of the central station type and not normally thought of as "portable," would meet the requirements of the space to be humidified in the Magee mill at Bloomsburg.

Negotiations with the Philadelphia silk mill were quickly completed and dismantling began. As equipment was removed from the abandoned mill, each piece of ductwork, apparatus casing and connections, dampers, outlets, structural steel and all other parts were carefully marked so that re-assembly would be simplified as much as possible. All parts of the complete equipment and accessories were salvaged, including structural steel supports, electrical conduits, switches and controls, steam and water piping.

A total of over 35,000 lbs. of equipment was loaded on trucks, often in pieces so large that the trucks had to take round about routes in order to miss low bridges. Upon arrival at Bloomsburg, the equipment was cleaned and painted, all dents and rough edges removed,

Continued on page 28

How Large and How Small Can Manganese Steel Castings Be Made?

The answer, in terms of what has been done, is "From many tons down to less than a pound." We show a few examples.

Picture 467 shows a 25,000 lb. one-piece manganese steel crusher mantle made for a gyratory crusher manufacturer. No. 330 shows a section of a barking drum used in paper mills. The manganese steel girth gear is over 15′ outside diameter and weighs 16,000 lbs. The two manganese steel tires are 13′ outside diameter and weigh 9,500 lbs. each.

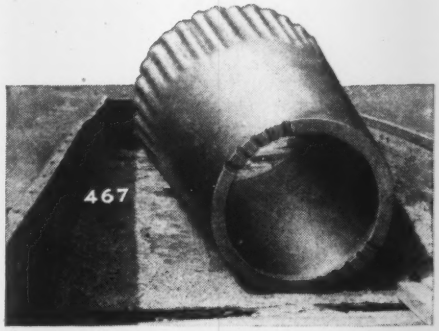
R-409 shows part of an order of bolster hanger key gib bearings for subway cars. Each casting weighs 7/10ths of a pound.

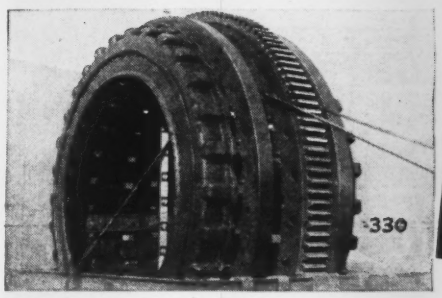
In all three of these applications, manganese steel was selected for its toughness to resist fracture and its ability to work-harden under impacts, friction and pressure.

Manganese steel castings, ranging from a chain link weighing a few ounces to a dredge pump shell 12 feet high, exhibit uniformly the high tensile strength, ductility and work-hardening property of "the toughest steel known."

By no means is manganese steel adaptable to every industrial use where a casting is required. But the range of sizes and successful applications suggests its consideration for your problem of breakage and wear.

Send for Catalog 59, describing all the uses for manganese steel.





Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois

AMERICAN Brake Shoe COMPANY

FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

and all controls and accessories checked and placed in first-class operating condition. Then reconstruction began. Equipment was re-assembled with original steel supports, old duct work was carefully erected in the two zones of the Magee weave room, salvaged controls, wiring and piping were installed and the system placed in operation.

Today, the Magee Carpet Company is weaving duck for the Army and the reclaimed Carrier equipment is serving as well as if it has been designed originally for the Magee operation. The system is maintaining a constant relative humidity of 70%, which assures uniform production. Idle equipment has been put to work, critical materials salvaged, and a first-class installation obtained.

Other Carrier equipment previously installed in the carpet company's plant serves to air-condition the office space, a testing laboratory, and to overcome atmospheric problems in the Dye House where stock dyeing is carried on.

Refrigerated Truck Trailer Feeds Men at Front

Fleets of refrigerated trailer trucks which temporarily become stationary refrigerators at the front after hauling up fresh food supplies are now made possible by a compact gasoline-driven refrigerating unit developed in the laboratories of the York Corp., York Pa.

These self-contained units are now being built at York for several hundred giant 10-ton trailer trucks which will go into service on all battlefronts. The equipment is designed to maintain a constant temperature as low as 10 degrees above zero in tropical climates where the mercury may soar to 120 degrees. The trailers will also resist a roof temperature of 150 degrees.

Used to transport fresh vegetables and meat, the trailers can be hauled up to active fighting areas and then left there to serve as fixed commissary until it is emptied and ready for the return trip. Operating independently of outside power sources, it is particularly valuable in areas which may be isolated from electric lines, according to York engineers.

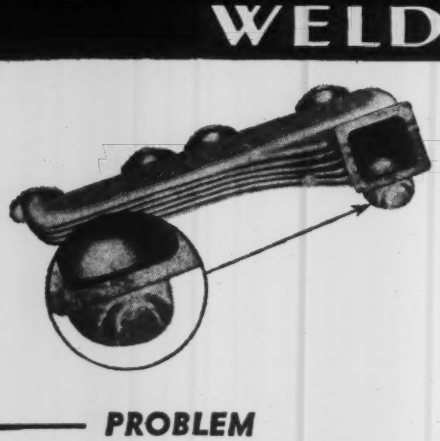
The self-contained refrigerating unit is installed in the nose of the trailer. It is automatic in operation.

Castolin Eutectic

EUTECTIC*

(Means Lowest Binding Alloy)

LOW TEMPERATURE WELDING



NO GENERAL PREHEATING REQUIRED FOR WELDING CAST IRON

PROBLEM

How to repair this cast iron exhaust with a color matching, heat resistant weld? With high temperature, fusion welding there was great risk of stresses, new cracks, and distortion even in the hands of the most skillful welder. Bronze brazing could not be used since the job requires a perfect color match.

SOLUTION

Eutectic Low Temperature Welding Alloy No. 14 was tried. Its low binding temperature (950-1400°F) eliminated risk of stresses, new cracks, and distortion. Many jobs require only slight local preheat • Weld has high heat resistance • Easily machinable • Perfectly color matching.

EUTECTIC LOW TEMPERATURE WELDING ALLOY RODS FOR CAST IRON

Alloy No.	Purpose	Binds at °F.	Tensile Strength, Lbs. p.s.i.	Machinable
15	Filling cracks, defects	354° - 600°	1,140 (pressure)	Yes
14	High strength joining	950° - 1400°	48,000	Yes
16	Joining cast iron to steel	1300° - 1600°	117,000	Yes
24B	Cast iron not subject to stresses		38,500	Yes
24	Cast iron subject to stresses		20-30,000	Yes

For oxy-acetylene: Eutectic Nos. 14, 15, 16. For AC-DC Metallic Arc: Eutectic Nos. 24, 24B.

Chart of 43 Eutectic Alloys for every metal and every welding job available free upon request.

36 PAGE "KNOW-HOW" MANUAL Z —WRITE TODAY!

Tells How Eutectic Can Help You!

*Reg. U. S. Pat. Off.

EUTECTIC WELDING ALLOYS COMPANY

Originators of the Low Temperature Welding Process

40 WORTH STREET, NEW YORK, 13, N.Y.

• BUSINESS CHANGES

Fairbanks-Morse Announces Changes in Personnel

Changes in personnel have recently been announced by R. H. Morse, Jr., General Sales Manager, Fairbanks, Morse & Co., Chicago, Illinois. These changes are as follows:

O. O. Lewis, formerly Branch Manager, Atlanta, Georgia has been promoted to the position of Assistant General Sales Manager of the company, Chicago, Illinois.

V. O. Harkness, former Manager of the company's Branch at Dallas, Texas, has been appointed Manager of the Diesel Engine Sales Division, Chicago.

H. J. Renken, former Manager of the Oil Field Division at Dallas, has now been made Branch House Manager of the company's Dallas, Texas, Branch where he will also continue to serve as Manager of the Oil Field Division in connection with his new duties.

J. S. Peterson, formerly Scale Department Manager of the Cincinnati Branch, has been promoted to the office of Branch Manager replacing the late Mr. Stanley Eaton.

G. N. Van Epps, formerly Manager of the Diesel Department, Chicago Branch, has been promoted to Manager of Branch at Atlanta, Ga.

Scannell Appointed Falk Corporation General Sales Manager

The Falk Corp., Milwaukee, Wisconsin, manufacturers of herringbone and helical gears, speed reducers, heavy drives, flexible couplings, and steel castings, announces the appointment of Thomas F. Scannell as General Sales Manager. In his new capacity Mr. Scannell will be responsible for the sale of all Falk products, including steel castings. Prior to his new appointment, Mr. Scannell was Sales Manager for all Falk products with the exception of those coming under the jurisdiction of the Foundry division.

Heretofore foundry sales and operations have been under the direct supervision of Arthur Simonson, Vice President, who has specialized in steel foundry production and sales with The Falk Corp. for the past 35 years. Following his technical education and industry training in England, he commenced work with us in 1909 and was engaged in steel making and metallurgy until 1916 when he was transferred to steel foundry sales. He became Vice President in Charge of Foundry Sales in 1927 and Vice President in Charge of all Foundry Operations in 1938.

• Keep Informed

John S. Wilkinson, who has been connected with the Falk foundry in various capacities for many years, will function as Assistant Sales Manager in Charge of Foundry Sales.

Mr. Scannell is a Yale alumnus, class of 1918, and served as Ensign in the United States Navy during the world war. After a number of years with the Chain Belt Company of Milwaukee, he joined the Falk organization in 1928 and has been successively St. Louis Representative and District Manager of the southwest territory with headquarters in Dallas. In April, 1940, he was transferred to Milwaukee, being appointed Sales Manager for all except foundry products in June of 1941. He is active in the affairs of the American Gear Manufacturers Association and holds memberships in the American Petroleum Institute, the American Society of Naval Engineers, and the American Society of Naval Architects and Marine Engineers.

General Radio Opens Chicago Office

To assist users of General Radio equipment in the Chicago and middle western area, the General Radio Co. has opened a Chicago engineering office which is located at 920 South Michigan Ave., Chicago 5, and the telephone number is Wabash 3820.

In charge of this office is Lucius E. Packard who for the past three years has been in charge of the New York engineering office. Mr. Packard is a graduate of the Massachusetts Institute of Technology, receiving his Bachelor of Science degree in 1935. Previous to his assignment to the New York office, he was a member of the factory engineering staff and was engaged in both development and commercial engineering work.

Customers in and around Chicago are urged to make use of the facilities of this new office and to get in touch with Mr. Packard on all matters regarding General Radio equipment design and procurement. His experience in the application of our instruments and his close contact with factory production schedules should materially increase the efficiency with which we can serve our midwestern customers.

Allegheny Ludlum Appoints Chief Engineer

E. L. Huff, formerly electrical engineer at the Brackenridge plant of the Allegheny Ludlum Steel Corp., has been appointed Chief Engineer of all the plants of the corporation according to a recent announcement by F. B. Lounsberry, Vice President in Charge of Manufacturing.

Westinghouse Man Appointed Consultant to Secretary of War

G. J. Stegemerten, Staff Supervisor of Industrial Methods Engineering for Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., was recently appointed Expert Consultant to the Secretary of War. His duties in connection with the appointment will cover special assignments from the Secretary of War's Office and will involve study of certain administrative functions in connection with the various arsenals and ordnance plants operated by the War Department. Mr. Stegemerten has been with Westinghouse since 1909 during which time he has held various manufacturing positions. In 1926 he was placed in administrative charge of the company's wage incentive activities. He has co-authored three books

Continued on page 30

Re-Issued

WITH A

Distinctive New Feature

A revised edition of our Tool Manual is just off the press. It has been brought up to date and a new section added, called "Tool Wear Analysis."

Unique ways and means for determining how overall performance may be improved following visual inspection of a dull tool are described and illustrated by charts. The analysis is based on the premise that the best tool performance and maximum life between regrinds is realized when conditions are such that the dulling of a carbide tip due to edge wear and dulling due to top surface wear are maintained in balance, and at a minimum.

This new section of the Manual suggests that a check be made: First, of the prevailing grinding methods to see if they are in harmony with recommended practice; second, of the cutting speed used, to ascertain if it is within the prescribed general range for the particular material being machined. A chart is provided to show the proper relation between speed and feed, and how adjustment may be made in this respect for best results as to wear resistance on a particular job within the limits of a single carbide grade. Finally, characteristics of the several KENNAMETAL grades are given with charts provided to facilitate analysis and to determine if a change in grade would be advisable to effect improvement.

You will, of course, want this valuable manual with its distinctive new feature; it will help assure the continued efficiency of your KENNAMETAL tools. A copy will be forwarded upon request.

—●—

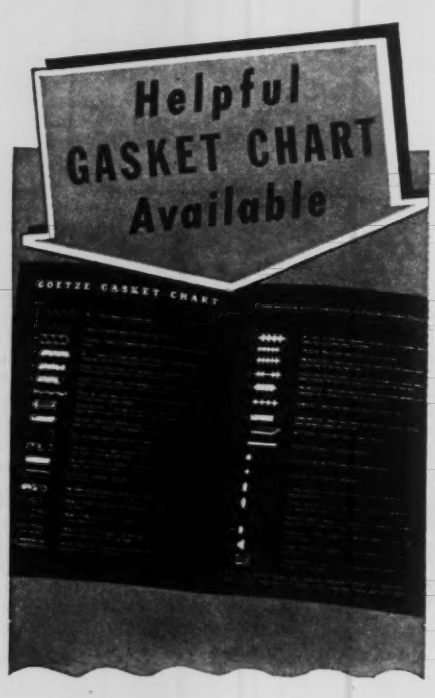
The revolutionary method of analysing tool wear discussed in the KENNAMETAL Manual is also available in form of a wall chart especially designed for shop and tool room use. Write for yours today.

KENNAMETAL

Trade Mark Reg. U. S. Pat. Off.

KENNAMETAL Inc.
367 LLOYD AVE.
LATROBE, PA.

SUPERIOR CEMENTED CARBIDES



An up-to-the-minute Gasket Chart showing the cross-sections of 36 most popular Gasket Types, their purposes and the characteristics which fit them for the specific services intended, is now available to interested engineers.

This chart has been issued as the third in a series of technical papers on Gaskets compiled by the Research Laboratory of the Goetze Gasket and Packing Company, Inc., oldest and largest manufacturers of industrial gaskets in America.

In requesting copies of this and succeeding issues of "The Gasket," write the company on your business letterhead, mentioning your position.

GOETZE GASKET & PACKING CO., Inc.
24 Allen Avenue, New Brunswick, N. J.

Goetze for GASKETS

• Keep Informed . . .

on time and motion study and wage incentive procedures and has written numerous technical magazine articles on the same subjects.

New Pemco-Nordstrom Offices Opened in Atlanta, Ga.

New offices of Pittsburgh Equitable Meter Company-Merco Nordstrom Valve Company have been opened in Atlanta, Georgia. C. C. Moore, who has been in charge of our Memphis office, is District Manager. The offices are located at 411 Bona Allen Building, Spring and Luckie Streets. The Memphis office will be closed at the end of December, so that all southern operations formerly cleared through Memphis will now be handled through Atlanta.

• LATEST CATALOGS

Welding Stainless Steels

To compress between the covers of one volume most of the essential information regarding the welding of stainless steels, together with three-dimensional, full-color illustrations of the accepted welding processes, might be termed a minor "miracle". Yet this achievement has been consummated, in the opinion of many veteran engineers, with the issuance by the Allegheny Ludlum Steel Corp., Brackenridge, Pa., of a remarkable study in this field—a 64 page, 9 × 12 size book titled, "Welding Stainless Steels".

This comprehensive instruction book contains more than a hundred color illustrations, charts, sketches, and photographs, covering every pertinent operation in the welding of the various types of Allegheny Metal. All the informational material contained in this welder's "bible" springs from years of intensive research and practical experience on the part of metallurgists and engineers of the Allegheny Ludlum Steel Corp.

The timeliness of the publication cannot be over-emphasized in view of America's continuously expanding program of production aid in industrial training now underway. It is certain to prove helpful to engineers, designers and production men, as well as speeding the war effort in colleges, trade schools, industrial apprentice classes, and other government-sponsored training activities.

Perhaps the most important aspect of "Welding Stainless Steels" is its interesting and novel approach to the subject. Elaborate illustrations not only embellish and clarify the text, but also enable the amateur or student, at the very outset, to grasp the fundamentals of the subject matter at hand, and to gain a thorough knowledge of the types of stainless steel and their individual characteristics and methods of welding.

This simplifying effect is secured by a vivid pictorial technique, which in itself is a unique departure from that used in ordinary engineering treatises. It is, actually, visualizations of the phenomena of stainless steels and welding processes by one of the nation's well-known industrial designers, Peter Muller-Munk. The reader is oriented by a series of logical steps to the main body of the welding study, made graphic by the adroit use of three-dimensional color illustrations, detailed sketches and techniques employed in welding stainless steels, and photographs and diagrams explaining each progressive procedure.

Since stainless steel is a vastly different metal from carbon steel, the book serves a tremendously important function. It explains how welding methods commonly employed must be modified to suit the characteristics of individual grades of Allegheny Metal in order to obtain most satisfactory results. In fulfilling the purpose for which it was published the book makes the subject not only absorbingly real, but truly formative and educational. Furthermore it supplements a technical service constantly maintained by Allegheny Ludlum: namely a program of assistance which offers to business and industry both personal consultation and complete laboratory data on the properties and fabrication of Allegheny Metal in the form of "Blue Sheets", which may be obtained upon request.

The Allegheny Ludlum Steel Corp. is anxious to make "Welding Stainless Steels" available to those government, business, and industrial organizations where it may prove

PROFESSIONAL SERVICE

in ALL BRANCHES of the ENGINEERING FIELD

Consulting Engineers
Engineering Organizations
Constructors—Contractors
Patent Lawyers, Etc.

Consultants on All Water Problems
Boiler, Process and Municipal Water ★ Waste and Sewage Disposal ★ Consultation ★ Design ★ Analysis
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Power Plants and Electrical Distribution for Industry Surveys, Reports, Design, Construction, Supervision.
EDWARD R. FEICHT
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Chemical and Metallographical Laboratories—Welding . . . Supervision, Inspection and Testing, Qualification of Operators and Procedure.
THE JAMES H. HERRON CO., Cleveland, Ohio

Power Plants • New • Rehabilitation
Steam Generation — Diesel amd Steam Power
Z. KOGAN, Consulting Service, — CHICAGO

Weld Testing—Qualification of Operators—Supervision—Inspection—Research.
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Patents Obtained and Searched for any Invention in U.S. Patent Office.—Confidential Advice—Literature
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Power Plants, Structures Transmission Systems—Design, Supervision, Inspection, Appraisals Reports.
SARGENT & LUNDY
140 S. Dearborn St., Chicago, Ill.

RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

• Keep Informed

to be an important aid in war and post-war production, and in the training of students and apprentices. Copies may be obtained at no cost by sending requests directly to the Allegheny Ludlum Steel Corp., Brackenridge, Pa.

"I Shall Arise"

That is the expressive title of the portfolio of Typhonite Eldorado pencil drawings by Samuel Chamberlain just off the press.

Samuel Chamberlain has selected for his subjects buildings of art and historical importance bombed and laid waste by the ravaging Nazis when their Luftwaffe terrorized unprepared Europe in the early days of the war.

Some of the titles in this impressive series follow: Coventry, Church of St. Maclou, Dover Castle, Church of St. Vulfran, Library of the University of Louvain, The Town Hall, St. Clement Danes, Church of St. Laurens, Courtyard in the Temple, St. Peter's Hospital, Guildhall.

Each reproduction is devoid of advertising and ready for framing.

Write for your copy to: Pencil Sales Department, Joseph Dixon Crucible Co., Jersey City 3, N. J.

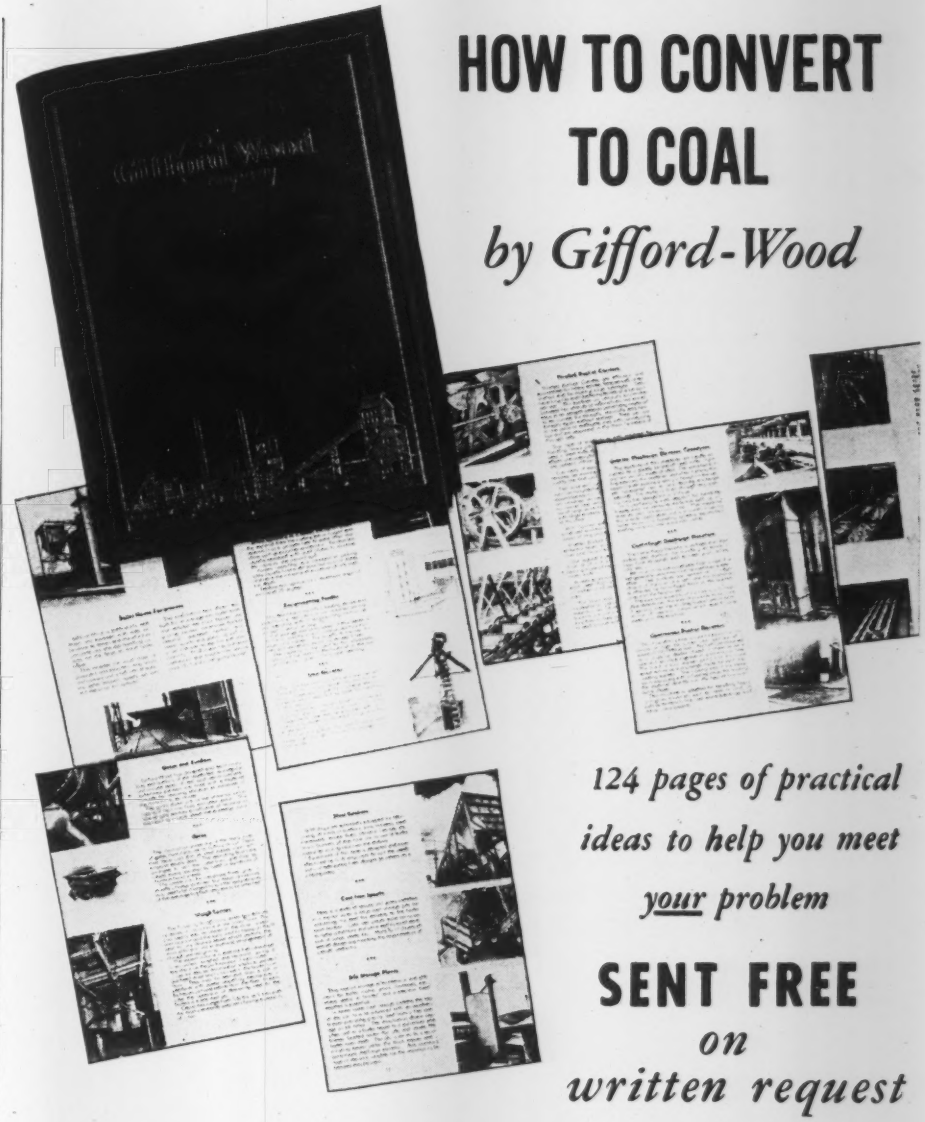
New Check Charts for Stokers Announced

Operating and maintenance hints for efficient operation and minimum outage are listed in two new Check Charts for Single-Retort and Multiple-Retort Stokers announced by Westinghouse Electric & Manufacturing Co.

The new Check Charts, designed to make regular and thorough inspection of stokers easy, are heavy cardboard approximately 16 × 21 inches. First items to be checked are instruments—draft gauges, steam and feed-water meters, steam-flow and air-flow meters. Air requirements are considered—too little air and too much fuel wastes heat of partially burned fuel, causes smoke; too much air and too little fuel wastes heat, requires more coal and produces more ash.

Other maintenance hints given include the following: See that draft is adequate; spread fuel evenly and to proper depth. To protect grates keep some ash to act as an insulator, but remove as fast as new ash is deposited. Examine boiler and furnace structure for

Continued on page 32



HOW TO CONVERT TO COAL

by Gifford-Wood

124 pages of practical ideas to help you meet your problem

SENT FREE
on written request

If you are facing the necessity of quickly changing over to solid fuel—if you are contemplating changes in present coal, ash and other material handling or installation of new equipment—you'll find the latest Gifford-Wood Catalog a valuable guide toward your objective.

As specialists in the design, development and installation of complete coal and ash handling systems with many notable jobs to our credit, Gifford-Wood offers you this 124-page book of tried and proved ideas which can be applied to meet your conditions and requirements.

Whatever the present fuel situation, keep in mind that our Country's coal resources are practically inexhaustible. In the long run you'll be safer with coal.

Write for your copy of Catalog 200-P on your company's stationery please.

GIFFORD-WOOD CO.

FOUNDED 1814

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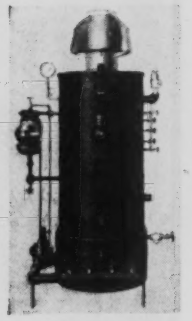
Ash Spouts • Barge Unloading • Bins • Boiler House Equipment • Buckets • Bunkers • Carriers • Chutes • Conveyors • Crushers • Elevators Feeders • Gates • Ground Storage Systems • Hoists • Hoppers • Infra-Red Drying Systems • Screens • Silo Storage Plants • Tanks • Weigh Larries

KANE AUTOMATIC GAS-FIRED STEAM BOILERS

are also doing

ESSENTIAL WAR WORK

furnishing steam for



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Manufacturers of Automatic Steam Boilers for over a third of a century.

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IRVING GRATING PRODUCTS

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"A Fitting Grating for Every Purpose"

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Bridge Decks — Platforms
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Safe — Fireproof — Lasting — Strong
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Ventilating — Admits Light
Easy to Place — Fit Guaranteed

Welded

Catalog for the asking.

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WESTERN DIVISION: FOOT OF PARK AVENUE
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possible leaks (charts list places where leaks may occur).

For both link-grate and dump-grate stokers, the charts give quick facts on starting the fire, maintaining fuel bed, dumping ash, banking.

The new Check Charts for Single and Multiple-Retort Stokers can be secured from Department 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

The Latest Issue of "Sparks"

With graphic presentation in word and in picture, the fall issue of Sparks, house magazine of Tube Turns, Inc., Louisville, Kentucky, is dedicated to telling the success story of welding in the shipbuilding industry.

Appearance of the fall number is significant in that it is in line with the policy of Tube Turns' new advertising manager, Gene Wedereit, in seeking out and developing current and postwar markets. Wedereit, who was formerly vice-president and director of creative service with the E. F. Schmidt Co., of Milwaukee, came to Louisville July 1 as a result of his work in the designing and production of Tube Turns' new 240-page catalog.

Sparks, in this latest issue, carries a double-page spread showing how welding was recently employed to graft a new bow on the torpedoed destroyer Blakely and put her quickly back into service as good as ever. An item worthy of addition to anybody's collection of ship pictures is the full page of silhouettes of 24 of the types of ships which comprise Uncle Sam's maritime strength.

It's almost impossible for an average person to realize that there is something like a quarter of a million lineal feet of piping—about 50 miles of it—in the average ship. By chart and by picture Sparks shows how Tube-Turns welding fittings are enabling shipbuilders to speed up this enormous job of pipe installation and at the same time to save weight and space—in short to do a better job of getting American ships off the ways and out on the high seas all over the world.

Popular demand for earlier editions of Sparks, successively featuring welding's vital role in the battle of production, the war production campaign, and the history of piping, raised the circulation to more than 20,000 copies per issue.

Electric Car Spotter

Completion of a 16-page, illustrated Book 1992 on self-contained Electric Car Spotters is announced by Link-Belt Co.

The new book covers vertical-capstan units of 5,000 and 10,000 lbs. starting pull capacity, for mounting on a stationary foundation, or equipped with portable frame for convenient transfer from one location to another.

The electric motor can be integrally mounted on car spotter, or connected by flexible coupling and compactly mounted on a welded steel base common to motor and spotter.

Other uses enumerated, and illustrated, are pulling piles of lumber into and out of kilns; moving kier cars in textile mill; warping vessels along docks; launching and beaching flying boats; serving car-hearth furnaces; and dragging heavy loads along ground.

Horizontal-drum type car pullers for heavy duty service, and special capstans and anchor windlasses for marine service, are also shown.

A copy of new Book No. 1992 may be obtained by writing direct to Link-Belt Co., 2410 West 18th St., Chicago 8, Ill., or other office of the company.

New Bulletin Summarizes Taylor Industrial Instrument Line

To help industrial instrument users determine easily what Taylor Instruments are best suited to their particular requirements, the Taylor Instrument Companies of Rochester, N. Y., has just completed a 24-page bulletin "The Taylor Guide to Correct Instrument Selection," covering briefly their entire industrial instrument line.

The catalogue is prefaced with a brief note on the importance of correct instrumentation in these days when highest possible efficiency is the rule in all processing and power plant operations. Then follows an outline of the unique interchangeable feature of Taylor instruments which makes their use both efficient and economical. The reader is shown the importance of related, pre-calibrated units that are removable and interchangeable, and that all fit into the standard Taylor case which is drilled and tapped to take the simplest indicating or recording mechanism or the most complex control units.

To make it easy to use, the bulletin is divided according to the variables to be measured or controlled, i.e. temperature, pressure, rate of flow, liquid level, force, position, time cycle, and humidity, with a clear exposition on how the three basic types of Taylor Instruments—indicating, recording and controlling—are adapted to suit these variables.

COMING MEETINGS AND EXPOSITIONS

During the next three months

JANUARY

10–14	Society of Automotive Engineers, Annual Meeting and Engineering Display, Book-Cadillac Hotel, Detroit, Mich.
12–13	American Management Association, Marketing Conference, Waldorf-Astoria Hotel, New York, N. Y.
24–28	American Institute of Electrical Engineers, National Technical Meeting, Engineering Societies Building, New York, N. Y.
25	American Boiler Manufacturers Association and Affiliated Industries, Mid-Winter Meeting, Hotel Cleveland, Cleveland, Ohio
31–Feb. 2	American Society of Heating and Ventilating Engineers, Fiftieth Annual Meeting, New York, N. Y.

FEBRUARY

1–2	American Management Association Finance Conference, Hotel New Yorker, New York, N. Y.
9–11	American Management Association, Personnel Conference, Palmer House, Chicago, Ill.
10–11	The Engineering Institute of Canada, 58th Annual Meeting, Chateau Frontenac, Quebec City, Canada
14–17	Technical Association Pulp & Paper Industry, Annual Meeting, Commodore Hotel, New York, N. Y.
20–24	American Institute of Mining and Metallurgical Engineers, Annual Meeting, Waldorf-Astoria, New York, N. Y.
21–23	Greater New York Safety Council, 15th Annual Convention and Exposition of Safety Equipment, Hotel Pennsylvania, New York, N. Y.
28–31	American Management Association Packaging Conference, Palmer House, Chicago, Ill.

For Calendar of coming A.S.M.E. Meetings see page 80 in the editorial section.

• Keep Informed

The final pages are devoted to special function instruments. There the reader will find descriptions of time-schedule, pneumatic-set and mechanical-type ratio controllers, remote pneumatic transmission systems, expansion-type temperature controllers, diaphragm valves, lever motors, self-acting temperature controllers, precision valve action units, etc. This is followed by a brief treatment on the subject of Coordinated Control Systems.

Also included are sections on Mercury-in-glass thermometers for use on industrial apparatus and intermittent testing; etched-stem glass thermometers and hydrometers for laboratories and general industrial use.

Reference is made to available catalogues for those wishing more complete details about any type of instrument described in the new booklet.

Write for Bulletin 98170.

Central Vacuum Cleaning Systems

"Exidust" Central Vacuum Cleaning Systems for industrial plants and buildings of all types are described in a new bulletin which has just been prepared by Allen Billmyre Co. The bulletin concisely outlines the benefits of this type of cleaning system, explains the special features and details of "Exidust" equipment, and the illustrations include sectional views and typical installation layouts. Copies of the bulletin can be obtained by writing to Allen Billmyre Co., 431 Fayette Ave., Mamaroneck, N. Y. and asking for Bulletin D4.

Multiple Spreader Stokers

Bulletin 78 graphically presents the fire-over-fire principle of the Fyr-Feeder Multiple Spreader Stoker, which is a combination of mechanical and pneumatic coal feed. The catalog also illustrates a number of applications of the stoker in various types of boilers, American Coal Burner Co., 18 E. Erie St., Chicago, Ill.

Now Kennametal Catalog

Kennametal, Inc., 367 Lloyd Avenue, Latrobe, Pa., has just issued a new Catalog 43C, in which the prices of standard tools and blanks have been reduced. It embodies three well-illustrated sections.

The first contains specification and prices of standard tools together with line cuts, halftones, and representative applications.

The second section gives similar information for typical tools, including new lines of solid round and solid square "Kennametal" precision boring tools; also information on standard and non-standard blanks, and "Kennametal" specialties, such as lathe and grinder centers, balls, gage tips, etc.

The third section deals with the origin and characteristics of "Kennametal," how to select the proper grade, how to specify and order tools and blanks, information on the several types of chip breakers, instructions on brazing blanks to tool shanks, proper grinding methods, and the milling of steel with carbide tipped cutters of simple design.

A copy of this new Catalog 43C can be obtained upon request.

How Manganese Steel Helps Railroads Told in Booklet

American railroads today are performing a magnificent service to the nation in handling troops, munitions of war and other military impedimenta, and they are doing this with much equipment that is far from new and with greatly limited manpower. A handsome 32-page booklet which is both a tribute to Yankee railroading genius, and an explanation of the advantages of manganese

Continued on page 34

Simplicity of Design Means Easier Maintenance

SERVICING IN THE LINE SAVES TIME . . . . . .

. . . and it saves the valve, too, because regular servicing not only keeps the valve in top condition and gives it longer life, but it reduces the possibility of having to make extensive repairs later. The simplicity of Lunkenheimer design makes all parts accessible for checking any first signs of lagging operation, and the taking of precautionary steps.

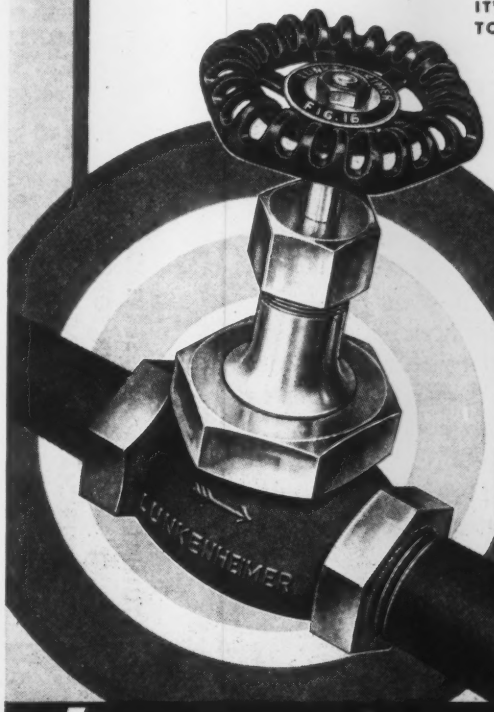
Valves are among your most vital production equipment . . . in fact, the very backbone of your production lines. That's why new valves are scarce and hard to get. That's why it's not only good business, but imperative business, to take the best of care of the valves you now have in service.

It's not a difficult job. Valves respond to good treatment and the little time required to keep them in top condition will be well repaid in uninterrupted production.

Use the complete facilities of Lunkenheimer distributors.

IT'S EASY . . . TO GET TO THE WORKING PARTS

Simply open the valve part way, unscrew union ring, and the complete assembly of working parts can be lifted from the body—for inspection, cleaning, seat and disc regrinding, or replacement of parts if necessary.



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THE LUNKENHEIMER CO.
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NEW YORK 13 CHICAGO 6
BOSTON 10 PHILADELPHIA 7
EXPORT DEPT. 318-322 HUDSON ST., NEW YORK 13, N. Y.

LUNKENHEIMER VALVES

steel in numerous and diversified uses in the industry, is Bulletin 943-R just published for general distribution among railroad executives by the American Manganese Steel Division of the American Brake Shoe Co., Chicago Heights, Illinois.

Steel plays a tremendously important part in running our railroads, and austenitic manganese steel has demonstrated its superiority as the steel for low cost maintenance in track, shop or rolling stock. For nearly forty years, this "toughest steel known" has been practically standard for track crossing and frogs, and because of its use has steadily spread to a wide range of other equipment.

A large section of the bulletin is devoted to describing and illustrating car and locomotive wearing parts and to surprising tests which show that longer life, greater resistance to wear and easier maintenance can be expected when manganese steel is employed. Special sections for track work, track maintenance accessories, power shovel dippers, lifting magnet plates and welding materials are included.

The bulletin will be sent without obligation on request.

Fundamentals of Electronic Control for Resistance Welding

An attractive 46-page booklet (GET-1170) consisting for the most part of published articles by General Electric engineers on the circuits and operation of electronic controls for resistance welding, has been published by the General Electric Co. In the booklet, simplified circuit diagrams are used liberally in explaining the fundamentals of the many types of G-E electronic controls available to meet the exacting requirements of individual resistance welding processes and jobs.

Titles of the six articles reproduced in the booklet are: Electronic Welding Control; Seam and Pulsation Welding Controls; Special Welding Controls; Timers for Welding Control; Energy Storage Welding Controls; and Servicing Resistance Welding Controls.

A pictorial presentation of all types of G-E electronic controls for resistance welding follows the article. Also portrayed are the many electric accessories G-E has available for resistance welding processes, including the electrode pressure gage, the magnetic oscilloscope, cable, capacitors, motors, air circuit breakers and the pointer-stop ammeter.

"De Laval Pumping Unit at Philadelphia"

The bulletin "De Laval Pumping Units at Philadelphia" traces notable developments in the history of one of America's oldest and largest water systems. In the year 1801 the City of Philadelphia installed its first engine-driven pumping unit. In 1907, Philadelphia was one of the first American municipalities to use centrifugal pumps for water works service, a $2\frac{1}{2}$ m.g.d., 213 ft. head turbine-driven pump having been installed at the Torresdale Station of that city. The very latest pumps ordered by Philadelphia, four 40 m.g.d. units, were built and ready for installation when diverted by order of the W.P.B. to meet urgent requirements of the City of Detroit, Mich., to which they have been leased by Philadelphia. The bulletin also includes interesting information concerning the effect of wear on pump efficiency, tests made six years after installation having shown no measurable loss in efficiency. The bulletin is abundantly illustrated with photographs of the various Philadelphia pumping stations, in addition to flow diagrams showing interflow connections of Philadelphia's pumping plants and filtration systems. Copies may be had by writing to the De Laval Steam Turbine Co., Trenton 2, New Jersey. Send for Bulletin E-1180.

Thy-Mo-Trol Drive

The Thy-mo-trol, G. E.'s pioneer electronic drive for providing and controlling adjustable-voltage power from a-c lines thus making possible the utilization of the inherent advantages of d-c motors, is described in an attractive new 40-page bulletin (GEA-4025) recently issued by the General Electric Co.

The bulletin, well illustrated throughout, is divided into two parts. The first part explains the unique Thy-mo-trol drive in considerable detail, describes its functions, and lists its advantages. This section also lists many Thy-mo-trol applications and describes some of them. Typical applications listed include: installations on grinders, turret lathes, drill presses, conveyors, and form-and-thread milling machines; and to machines for testing tachometers, magnetos, propeller governors, and the tensile strength of various materials.

The second part of the publication is devoted to a complete, easily understood, technical explanation of the Thy-mo-trol drive's operation.

SCALE AND CORROSION CAN CRIPPLE YOUR PLANT

YOUR plant is being attacked today, tonight, every day by a destructive force. Scale and corrosion are enemies to your piping system, boilers, and condensers. So secretive is their work that before you realize it your plant efficiency is reduced and your production slowed up. Call in a Haering engineer today without obligation. He will show you how Haering Glucosates save you money and increase production. He will prove to you that Haering Glucosates correct these conditions definitely and protect your equipment against scale and corrosion.

Write for these booklets:

"Organic Methods of Scale and Corrosion Control"

"H-O-H Lighthouse"

D. W. HAERING & CO., Inc.
GENERAL OFFICES
205 West Wacker Drive, Chicago, Ill.
WE READ WATER

TUTHILL'S COOLANT PUMP LAUGHS AT CHIPS AND GRIT

TUTHILL PUMPS ARE SERVING ARMY • NAVY • AIR FORCE MERCHANT MARINE

No pump "absentee-ism" to slow up wartime production where Tuthill Model M Coolant Pumps are on the job. This internal-gear rotary pump has a built-in automatic by-pass that allows small chips and similar particles to pass through without serious injury to working parts. This exclusive safety feature assures long, dependable uninterrupted service. Sizes from 1 to 50 g.p.m. Available in stripped form for direct incorporation into the design of the machine. Write for complete catalog.

TUTHILL PUMP COMPANY
939 East 95th Street • Chicago 19, Illinois

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Announcements in this section are supplied by current advertisers in MECHANICAL ENGINEERING and A.S.M.E. MECHANICAL CATALOG. This section is restricted to these advertisers.

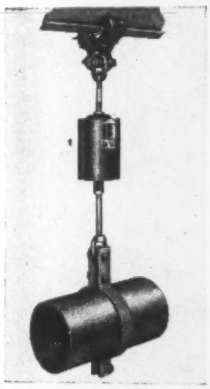
- *NEW EQUIPMENT*
- *BUSINESS CHANGES*
- *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

Pre-Engineered Spring Hanger

A new Pre-Engineered Spring Hanger, recently announced by Grinnell Co., Inc., Providence, R. I., is designed to minimize changes in pipe supporting force. Piping engineers who have struggled with the design of simple spring hangers to support modern flexibly supported piping systems will welcome this new hanger.



It will now be possible to select a stock size of hanger from a simple table after the load has been computed. The hanger is made in 14 sizes with a load range from 84 lbs. to 47001bs.

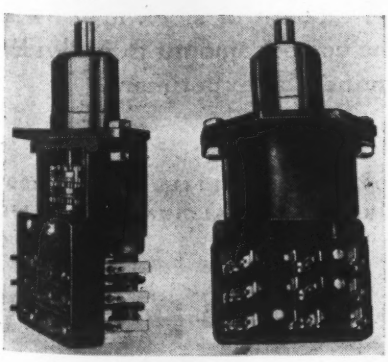
Its all-steel welded construction meets pressure piping code. A unique swivel coupling provides adjustment and eliminates turnbuckle. Its compact design cuts required head room to a minimum. Installation is simplified by integral load scale and travel indicator.

A descriptive bulletin gives full data on the hanger including simple capacity table. Copies are available by writing to Grinnell Co., Inc., Providence 1, R. I.

Geared Limit Switch

A new Geared Limit Switch manufactured and sold by Philadelphia Gear Works, Inc., Erie Ave. & G Streets, Philadelphia 34, Pa., has just been announced.

Two individually adjustable trains of intermittent gears are incorporated in this limit switch, with each train operating one contact drum having three double break contacts. Two of these contacts may be normally open and one normally closed or vice versa. The switch can be adjusted for operation between 2 and 3333 turns of the driving shaft at speeds ranging from 10 to 500 r.p.m.



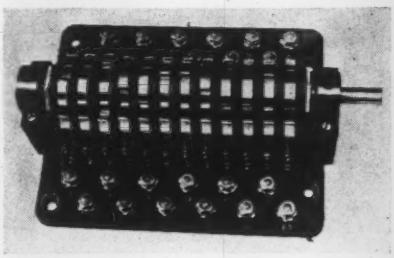
The all molded construction of the switch makes terminals easily accessible. Contacts, which are of silver, are double break, and are self cleaning due to wiping action. The contacts are conservatively rated for voltage up to 550 volts A.C. or D.C.

This switch is ideal for applications requiring a large number of turns between limits. It is particularly suited for the control or the position indication of hoist or crane mechanism, automatic doors, valves or dampers or any other mechanism where precision control or position indication is required. Mounting can be in any position and water-tight, weather-proof enclosures can be supplied if required.

This switch is available on short delivery on orders bearing suitable priorities.

Rotary Limit Switch

A new Rotary Limit Switch manufactured and sold by Philadelphia Gear Works, Inc., Erie Ave. & G Streets, Philadelphia 34, Pa., has just been announced.



This twelve circuit, direct connected rotary type limit switch, has twelve individual contact drums, each of which is separately adjustable by small increments. It can be used either as a continuously rotating or reversing switch and is suitable for operation in any position.

The all molded construction provides easily accessible terminals, silver to silver wiping and self-cleaning double break contacts, needle bearing shaft suspension. Contacts are conservatively rated for 125 volt A.C. applications.

For service requiring a multi-contact limit switch having flexibility and ease of adjustment, this switch is ideally suited.

The "Magna-Bond" Rotameter

Fischer & Porter Co. has developed the "Magna-Bond" Rotameter for all types of flow-rate measurement where fluids are too opaque, or the temperatures and pressures too high, or where the service is too hazardous to permit the use of direct reading rotameters and electrically operated control instruments.

The operation of the "Magna-Bond" is simple and positive. To the flow-indicating float, which moves up and down within the tapered borosilicate glass metering tube of the rotameter, an extension containing a transmitting magnet is attached. Through a strong magnetic "bond" an external fork accurately follows the transmitting magnet as it moves up and down within a well above the metering tube. The movement of the float is thus carried to the outside instrument which may be an indicator or recorder, or a pneumatic "Rotamatic" controller for complete automatic control.

The absence of stuffing boxes and the ability to compensate for a wide variation in viscosity caused by changes in chemical composition and temperature make the "Magna-Bond" an admirable instrument for metering, recording and totalizing the flow of low-grade Bunker "C" fuel oil. Hydrofluoric, hydrochloric, caustic soda, and many other dangerous fluids are handled equally as well. Further information about the "Magna-Bond" may be had by writing to Fischer & Porter Co., 97 County Line Road, Hatboro, Pennsylvania.

New Bruning 55C Printer Speeds Semi-Photographic Reproductions

Designed to take full advantage of the time-saving features inherent in semi-photographic reproduction processes, a new printer, especially adapted to this type of work, has just been announced by the Charles Bruning Co., Inc.

Used with the new semi-photographic materials, this new printer, known as the Bruning 55C Continuous Photographic Printer, provides clear and faithful duplicates of anything typed, printed, photographed or drawn. The 55C is a 42-inch printer, yet, owing to the exceptional compactness of its design, requires floor space of only 40 × 62 inches. It may be used either inside or outside of the dark room, and operates either with roll stock or cut sheets.

With a speed of 0 to 18 feet per minute, the Model 55C embodies improvements in light source and light control which assure maximum line opacity and clear, contrasting prints. Either of its two fluorescent lamps, one white and one amber, may be used in making exposures, depending upon the nature of the originals. The printing light is effectively sealed for dark room use. A constant speed motor drives the variable speed transmission which is controlled by a

knob easily in reach of the operator's hands. Speed changes are instant and positive. Further control of exposure is obtained by a unique shutter arrangement which varies the exposure space from 0 to 14 inches. Both the speed of the machine and the shutter are individually controlled.

In the design of this new printer, special care has been taken to provide the good contact so necessary in reproducing by a semi-

Continued on page 21

Information supplied by an Industrial Publication

There are two operational factors that have more to do with the life and efficiency of reamers than may be generally known. One is the matter of feeds and speeds; the other, the condition of the hole.

As to the former—with due regard to machine set-up, required finish, and part design—in general, reamer speeds should be from 60 to 70% of drilling speeds, and feeds should be two to three times faster.

The amount of stock left in the hole has considerable effect on reamer life. If there is insufficient stock, the reamer will tend to bind instead of cutting. This is also true with bell mouthed holes, caused by faulty drilling, or drilling without a guide bushing.

For efficient reaming in ferrous metals 1/64 inch of stock should be left on holes up to 1/2 inch diameter, and 1/32 inch left in holes of greater diameter. A smaller amount of stock may be left in softer metals. The correct amount in individual cases can be determined by experiment.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

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photographic process. A 9-inch pyrex cylinder revolving contact with 22 individual 2-inch bands assures that originals and sensitive materials remain in register, and prevents any slippage which might cause blurred prints.

From the operator's point of view, the Bruning 55C Printer provides new ease and simplicity in making reproductions. A unique feature of the 55C is the exceptionally large print return tray, which occupies the entire top of the machine. The originals enter the tray on top of the print, thus making possible easier handling of the work. By means of a foot pedal, the operator is able to reverse the travel of prints through the machine instantly. The adequately-sized feed board is illuminated to facilitate handling and all controls are individually illuminated by means of ruby or safe lights. The machine is mounted on casters for easy moving, and is attractively finished in two-tone green crinkle finish.

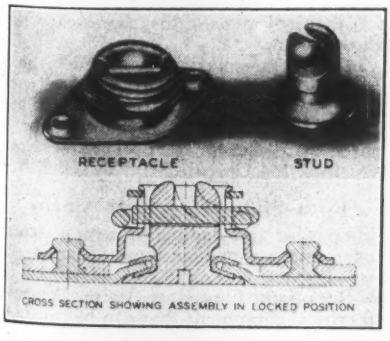
The electrical requirements of the Model 55C are 4 amperes—operating 110 volts. The machine is wired for 100 volts A. C. 60 cycle, or 220 volts D. C.

According to Bruning officials, the 55C Printer fills a distinct need today, when manpower shortages and the necessity for speed require the utmost efficiency in printing equipment. With the 55C Printer, pencil tracings are quickly and easily intensified in the reproduction, thus saving drafting time, and labor. Clear, sharp reproductions may be made of worn and soiled originals, thus obtaining a better negative than from a Van Dyke paper negative. Blue prints, layouts, maps and engineering data are quickly and easily reproduced. Originals which may be copied include those printed on one side or on both sides, on transparent or opaque materials. The printer facilitates the making of copies on waterproof papers and cloths for templets.

The 55C Printer is one of a line of modern printing and developing machines introduced by the Charles Bruning Co., Inc.

Elastic Stop Nut Corp. Adds New Fastener to Its Line

W. T. Hedlund, president of Elastic Stop Nut Corp. of America, Union, N. J., announces that his organization has acquired world rights to a new fastener which will add to the scope of his company's work in present war production as well as in postwar commercial use. The new fastener is a spring-lock device invented by Dr. E. L. Mack, and perfected by the Aircraft Parts Development Corporation, Summit, N. J., under the direction of D. C. Hungerford.



CROSS SECTION SHOWING ASSEMBLY IN LOCKED POSITION

The new fastener is a lightweight unit of extremely rugged construction and is particularly suited for holding the engine cowlings of high-speed war planes. The Army Air Forces have tested it at Wright Field and have found that it meets specifications for

Continued on page 22

CUTTING FLUIDS DESERVE YOUR SERIOUS ATTENTION

Well informed authorities have made the statement that more intelligent application of cutting fluids and better tool grinding would make possible a 30% increase in metal-working production. In these days of man-power shortage, what a challenge that statement presents!

Be honest . . . in your plant are cutting fluid problems given the attention they deserve? Are your performance records accurate? Are you aware of what better cutting fluids can do for the job? Or is your attention centered on other fields until real trouble develops which might be traceable to improper use of cutting fluids? Hundreds of metal-working plants are getting the most out of their cutting fluids by working closely with the Stuart service engineer. They know that there is no universal cutting fluid, no magic compound—but when a Stuart product is put on the job they are sure they have every cutting fluid advantage that broad engineering experience and "know how" can give them.

A REQUEST OF STUART CUSTOMERS
Containers of all types are critically scarce. We urge you to cooperate with the W. P. B. program to conserve containers by observing these four rules for handling drums.
1. Do not drop.
2. Use a little oil to avoid stripping threads in removing plugs.
3. Replace plugs carefully when drum is empty.
4. Keep drums under cover when emptied.

To be sure you have all the advantages, work with the Stuart service engineer, representing a company which has specialized in metal-working lubrication since 1865.

We invite you to write for our new free booklet, "The 577th Oil," which contains twenty-two case histories, typical examples of how Stuart engineering is solving production problems (like your own), as well as other valuable metal-working data. State your name, company and title.

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LIMITED
2741 SOUTH TROY STREET
CHICAGO 23, ILLINOIS
ESTABLISHED 1865
Warehouses in Principal Metal-Working Centers
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FABRICATION SPECIALISTS!

Carbon steel, Monel, chrome iron, pure nickel, nickel alloys, stainless-clad, nickel-clad, silicon bronzes . . . . . whether it's welded or riveted, a small job or a very big job, DOWNINGTOWN does them all well.

Right design. Right materials. Good workmanship. Thorough experience. Rigid supervision. Fair price . . . These are the advantages that are yours when you deal with DOWNINGTOWN! The quality of the job is assured by years of leadership and our long reputation for fine work.

Our facilities, the help of our metallurgical and engineering staff will be invaluable to you. Call on us, you are under no obligation, and we welcome inquiries.

Qualified and approved under U-69 of the A.S.M.E. Code by Hartford S. B. I. & I. Co.

DOWNINGTOWN IRON WORKS
DOWNINGTOWN, PA.
WELDED and RIVETED PRODUCTS

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use in any Army airplane. Also, after complete testing, the Navy's Bureau of Aeronautics has found that it meets Navy specifications for aircraft of that branch of the service.

In addition to its important uses on airplanes, this fastener is suited to many postwar commercial applications, such as access plates on farm machinery, panels on motor trucks, home heating units, radio equipment, and at any point where a quick-acting vibration-proof non-rattling fastening is needed.

Production tooling is in the final stages, and shipments will start in the latter part of January. Mr. Hedlund states that technical data covering tests, approvals and available sizes, are now available.

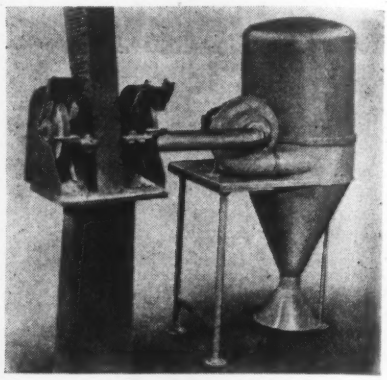
The addition of this fastener to the Elastic Stop Nut Corporation's production further enhances ESNA's position in supplying high grade fastenings of all types as part of its Postwar Planning Committee's program for being in a position to furnish special fastenings which will be required for the heavy postwar production of home appliances, automobiles, rail and bus lines, and other commercial uses.

Absenteeism Can Be Reduced

Dust collection in the factory is being recognized as of the highest importance since it not only is responsible for lessening absenteeism but for increases in output through better working conditions. Abrasive dust frequently works its way into the moving parts of finely adjusted machines causing expensive repair work not to mention incidental expensive lost time.

Dust collection to be of greatest benefit must be combined with efficient dust separation. Simply collecting the dust at the point of work must not be considered as a complete job by any means.

All of which directs attention to the various types of dust collecting systems now offered and Leiman Bros. latest unit dust collector combines not only the most powerful air suction to draw the dust away from the point of origin but it provides ample and efficient dust separation—in other



words it provides the proper space for expansion of the air inside the system to slow down the air current allowing the dust particles to drop away in the true engineering process as provided in larger and much more expensive multiple dust collectors.

Simply interposing a dust catching trap or screen in the air current does not adequately solve the problem since it quickly clogs up and must be replaced or cleaned more often than should be the case. True, such a trap or screen allows for reduction in size of the dust collector but too frequent attention to cleaning leads to neglect on the part of the users so that soon the outfit, while in operation, is not doing the work for which it was bought.

So Leiman Bros. natural method of dust collecting furnishes a reasonably compact outfit yet a more powerful one, considering both the strength of the suction and the volume of the air moved. It also furnishes the most efficient system of dust collection, separation and disposal and in such form as to make it easily moved from one machine to another in the shop. One unit takes care of one machine with one or two grinding wheels or buffs, a saw, a belt sander or other device. No heat in the room in winter being sucked away by your dust collector need be lost by being blown outside the building as no outside piping connections are required. No elaborate setting up is required and no dust can escape back into the room.

Complete information about these noiseless, powerful and efficient dust collecting units ranging in size from 1/4 HP and a floor space of about 20 × 30 inches may be secured by asking for item #A112 of Leiman Bros. Inc., 154 Christie St., Newark 5, N. J.

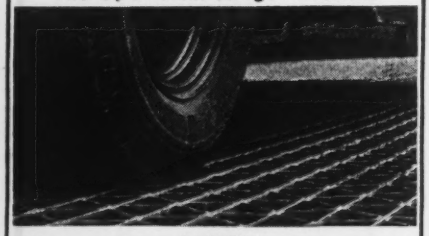
Rota-Sight Flow Rate Alarm

For visible and audible protection against dangerously low or high flows of liquids and gases Fischer & Porter has developed the new Rota-Sight Flow Rate Alarm. Valuable and critical equipment that can be ruined by failure of a cooling or lubricating flow, or a process or product that could be spoiled by excessive flows may be safeguarded with this positive new device.

The Rota-Sight Alarm operates through a float which moves up and down a pyrex tube into which triangular flutes have been fashioned. As the float rises, the area within

IRVING DECKING

The Open Steel Bridge Pavement



SAFETY
thru Cleanliness plus Traction

ECONOMY
thru Lightweight plus Durability

ESTABLISHED 1902
IRVING SUBWAY GRATING CO., INC.
HOME OFFICE and PLANT: 5010 27th STREET
LONG ISLAND CITY 1, NEW YORK
WESTERN DIVISION: FOOT OF PARK AVENUE
EMERYVILLE 8, CALIFORNIA

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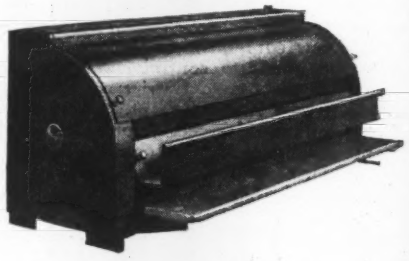
the flutes increases, causing the float to assume a position in the tube in direct proportion to the flow rate. A magnetic extension on the float trips an external switch to operate the alarm circuit. The alarm flow point is adjustable over the entire flow range and operates accurately at the set position.

The Rota-Sight Alarm is used for flows of water, lubricating oils, filter feeds, overflows, chemical additives, etc. It is built in sizes up to $2\frac{1}{2}$" and may be obtained in any corrosion-resistant metal that can be cast. Bulletin 92-B, with full description will be sent to you gladly, upon request, by Fischer & Porter Co., 97 County Line Road, Hatboro, Pa.

Pease New Whiteprint Developing Machine



A new moderately priced table model for developing whiteprint reproductions of engineering drawings and tracings has been made available by The C. F. Pease Co., 2623 West Irving Park Road, Chicago, Ill. This machine, known as the Pease "700" is a developer only, with two production speeds —four and eight feet per minute. Pease "700" is an easily operated machine which can be used in conjunction with any blueprinting or direct process printing machine using any dry direct process paper. It is especially suited to operate with Pease "77" and Pease "66" high pressure quartz tube printers using Pease Multazo Whiteprint Paper (Dry Direct Process).

The new Pease "700" developer is manufactured with sturdy, lightweight, welded steel construction. It features easy accessibility through quickly removable sheet metal guards, compactness of design and two forward speeds. It is made in two sizes, 42 and 54 inches and is an ideal machine for reproduction departments that require a moderate volume of dry direct process reproductions.

Four White Stars on National Forge "E" Flag

The Fourth White Star, for sustained excellence in production, has been awarded to the National Forge & Ordnance Co., Irvine, Warren County, Pa. This represents four successive six month periods of meritorious productive effort following the first Navy Ordnance "E" which was awarded to National Forge on October 24, 1941—before Pearl Harbor.

National Forge also has won the All-Navy "E" and the Army-Navy "E." In receiving the Fourth White Star from the Navy Board for Production Awards, National Forge has maintained a record for official recognition that dates back to the earliest days of the defense and war efforts.

Air Conditioning at Sangamo

Sangamo Electric Co., Springfield, Illinois, has recently completed installation of Carrier air conditioning equipment in the space where electrical indicating instruments for the armed forces are assembled. Sangamo

Continued on page 24

How Amsco Met Requirements for Easy Machining Non-Magnetic Alloy Parts. . . . . .

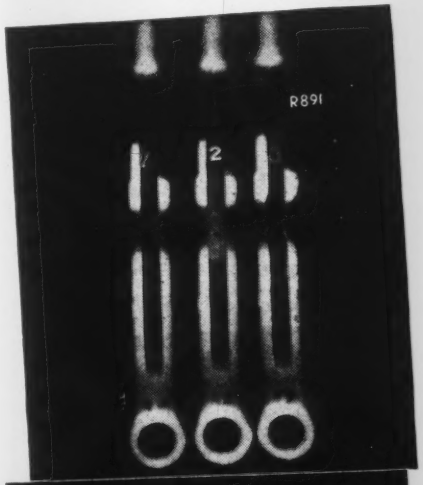
Non-magnetic parts having high tensile strength were required for special tractors. Amsco received an inquiry for a quantity of steering lever sets, with austenitic manganese steel specified; but the large amount of machining required ruled this metal out as the extreme toughness which gives it its durability also makes manganese steel difficult to machine with tools.

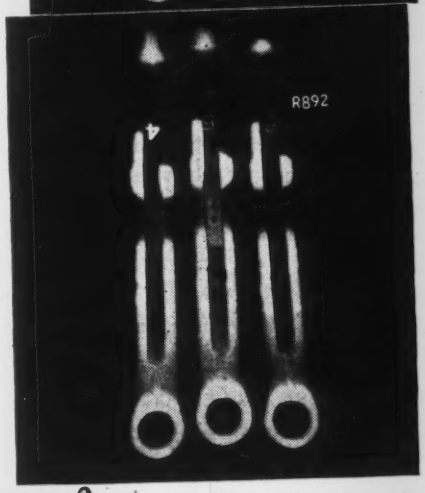
Amsco Alloy F-8N, a variation of the well known 18-8 grade of chromium-nickel alloy, having a magnetic permeability of approximately 1.003, was found satisfactory for these parts.

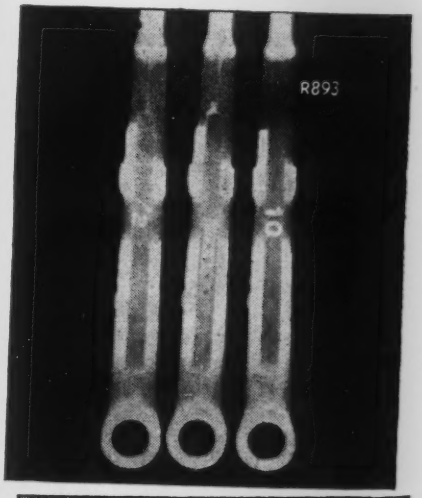
Small areas on each casting were to be flame-hardened (on the original cast steel specification). As it is not practicable to harden this particular grade of Amsco Alloy, a special hard-surfacing welding rod was developed by Amsco for the job. The castings were then coated on the required areas with this rod, before finish grinding.

Pictures R-891, 892 and 893 are reproductions of radiographs showing progressive stages in chill and heading practice to prevent shrinkage in the lever castings. The problem in producing these castings was the necessity of exceptional soundness. The shrinkage voids shown in R-891 and 892 were finally obviated (as seen in R-893) by various expedients that concentrated the shrinkage areas in a position where a feeder head could supply the necessary metal.

Inquiries regarding unusual requirements are always welcome at Amsco.





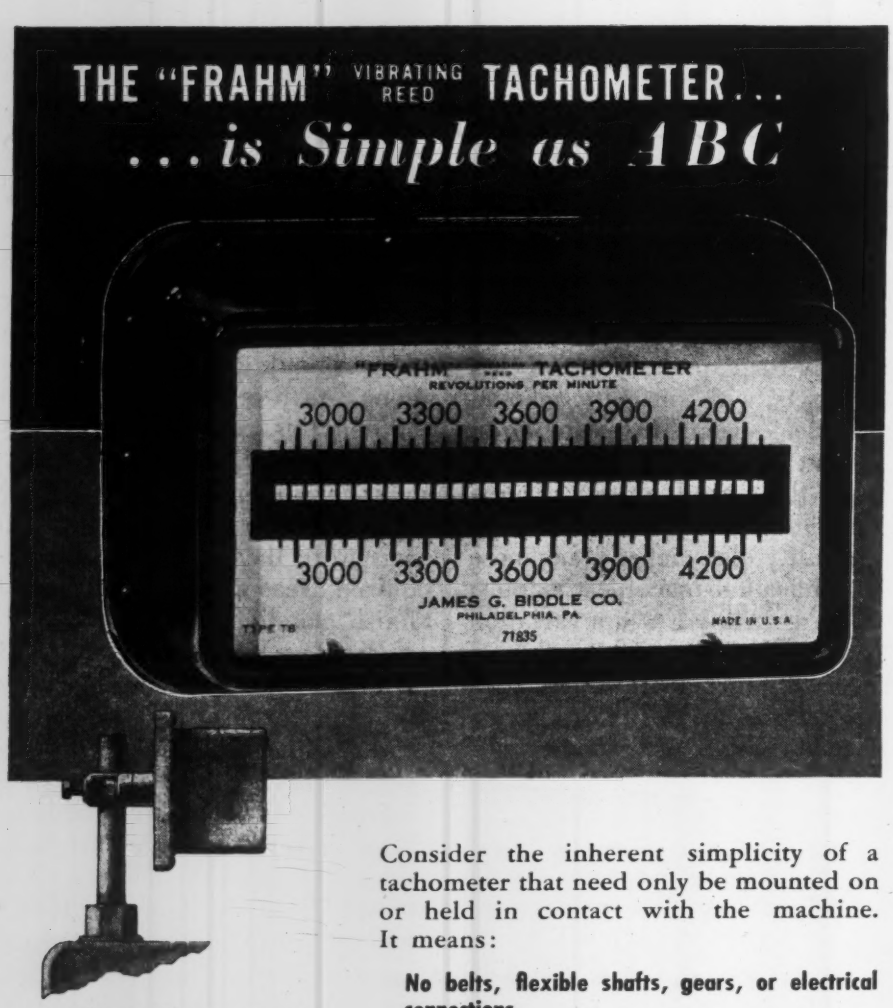


Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois
FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

AMERICAN Brake Shoe COMPANY

THE "FRAHM" VIBRATING REED TACHOMETER...

...is Simple as ABC



Above: Showing one method of mounting the Frahm Tachometer.

Below, left: Frahm Hand Tachometer.

Below, right: Frahm Permanent Mount Tachometer.

Consider the inherent simplicity of a tachometer that need only be mounted on or held in contact with the machine. It means:

No belts, flexible shafts, gears, or electrical connections.

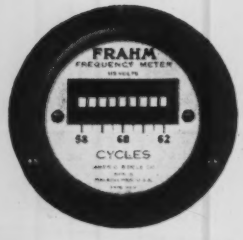
No lubrication required; No maintenance.

Independence from any outside source of power.

And the Frahm Tachometer is as accurate as it is reliable. It functions faithfully without attention year after year because there are no delicate parts—no springs, jeweled bearings, pivots, weights, magnets or connecting wires—nothing except a set of steel reeds, accurately calibrated and suitably mounted.

Furnished in stationary and portable types . . . for use on turbines, generators, motors, blowers, centrifugal pumps, Diesel-electric installations, etc. Various ranges available from 900 to 30,000 r.p.m.

For a complete description of Frahm Tachometers, together with list of types and ranges commonly supplied, write for Bulletin 1590-M.



"FRAHM" VIBRATING-REED FREQUENCY METERS—operate on the same unique principle as Frahm Tachometers, except that reed vibration is produced electrically instead of by direct mechanical contact. Unaffected by wave form or ordinary temperature changes. Switchboard, portable and miniature types in various ranges from 10 to 500 cycles per second. Write for Bulletin 1695-M.

JAMES G. BIDDLE CO. • **1211-13 ARCH STREET PHILADELPHIA 7, PA.**

• Keep Informed

Electric is a subcontractor for the Weston Electrical Instrument Corp., Newark, N. J. Purpose of the air conditioning installation, described by a Sangamo Electric official as "extremely important," is to provide air cleanliness and temperature and humidity control.

The benefits gained with air conditioning are many. Cleanliness, in the manufacture of electrical indicating instruments, is very important, and air conditioning filters the air, removing lint and small particles of dirt, which would be harmful on the inside of the instrument case. Removal of moisture from the air prevents rust from forming on the parts made from steel, and also reduces, to a minimum on the operators' hands, perspiration, which is harmful to the instrument. An increase in operators' efficiency, due to favorable conditions of the air, has been noted.

The new equipment to provide temperature and humidity control and cleaned air comprises the second Carrier installation at the Sangamo Electric Plant. In 1942, the air conditioning company provided equipment serving space in which mica capacitors are made, as well as special devices for the Navy and the Signal Corps.

Engineers Develop New Plastic for Stress-Study Problems

Not so long ago research chemists were searching for new plastics, hoping to achieve an electrical insulation with certain properties. In making such an exploration, numerous ingredients in that plastic series must be tried in different combinations, according to Westinghouse engineers. One of the resulting plastics, not suitable for the insulation problem, did prove valuable for other uses in this case.

FROZEN FRINGE PATTERN IN A CRANE HOOK MODEL

Three-dimensional models for photoelastic stress studies are made from the new plastic. After the transparent material is stressed in a realistic manner, the stress lines show up as different colors when observed under polarized light. Heretofore, suitable plastic for these models could be obtained only in small pieces—sheets measured less than 100 square inches and were only $\frac{3}{4}$ inches thick. Several months to a year were required to cure the old material satisfactorily.

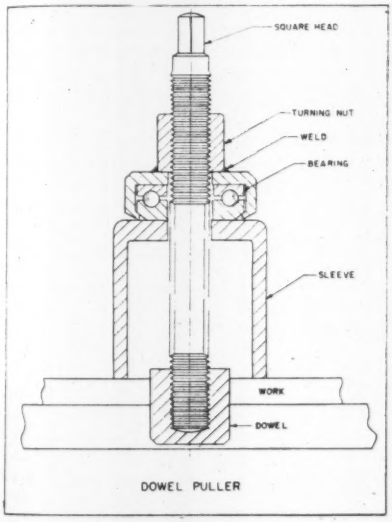
The new plastic has no such limits. Furthermore, it can be made in large pieces. Already produced in the laboratory in sheets measuring 600 inches square by three inches thick, it can be cured in two days.

Larger and thicker pieces of the photoelastic product will permit stress analysis of large full-scale models. In addition, studies can be made at lower cost than was previously possible.

Transparent plastic model of a crane-hook photographed by means of polarized light, which vibrates in a single plane instead of scattering like ordinary light. Refracted by the stress lines in the model, the light produces interference bands showing the points where greatest load is borne by the hook. In ordinary light, no lines appear in the model. Recently Westinghouse engineers developed a new plastic for this purpose that can be produced cheaply in big quantities.

Dowel Pin Pullers

Two types of dowel pin pullers suggested by workmen are used effectively at General Electric's Schenectady Works.



DOWEL PULLER

One, suggested by Francis Barton, has a knurled cylindrical sliding member which serves as a hammer. It slides along a shaft which is threaded at both ends. One end of the shaft is fitted with interchangeable heads threaded to fit various sized dowel pins. The other end of the shaft is fitted with a turned piece of machine steel which serves as an anvil against which the sliding member is pounded to remove the dowel. This device can also be used to drive dowel pins into place by reversing the action of the sliding member.

The second dowel pin puller, suggested by Samuel Solini, employs a turning nut into which a ball bearing has been inserted. This eliminates friction between the turning nut and the sleeve, making it easy to exert a strong and steady force on the dowel pin, and reducing wear on the working parts.

American-Made Synthetic Rubber

Akron, O.—The sole reason we were able to meet the rubber crisis which became acute in July 1942, when Japan completely took over the plantations of the Far East, was the fact that the 10-year development of synthetic rubber in the United States prior to Pearl Harbor had culminated in May of 1941, in the laying of groundwork for manufacture of synthetics on a practicable commercial basis.

Today, synthetic rubber produced in the United States is far superior to that made in Germany where the material was first produced and in many respects, the American-made product greatly excels even natural rubber which is now completely under the control of Japan.

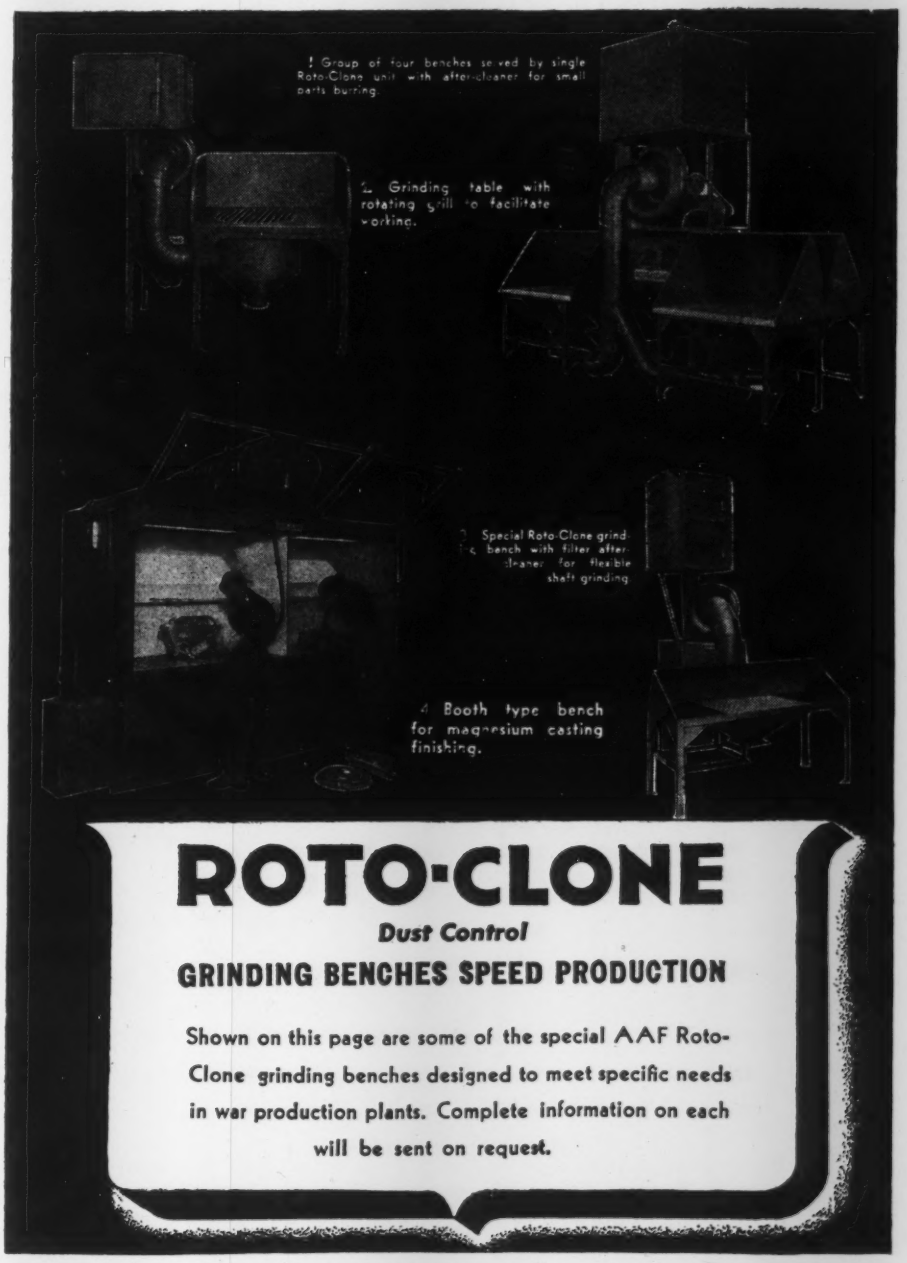
These facts, together with the prediction that the return of natural rubber following the war will not impede progress of synthetic, were brought out recently by R. E. Bitter, Technical Service Engineer of the Hycar Chemical Company, the country's largest private producers of butadiene type synthetic, in a talk on the industry's history and development before the Convention of Science Teachers at Grand Rapids, Michigan.

"Advances in the technology of rubber, sparked chiefly by American chemists," Mr. Bitter said, "occurred rapidly in the early 20th Century. This resulted in the excellent rubber products which furnished the basis of comfortable American living before December 7th, 1941.

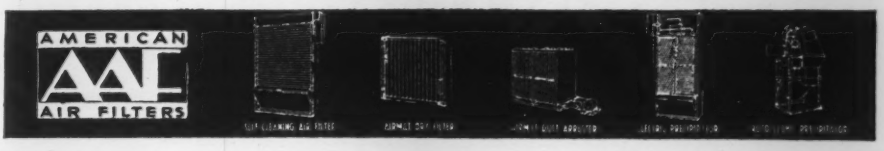
"Here we were, then, educated by American industry and ingenuity to consider rubber as one of the prime essentials of our mode of life—and the source of 90 percent of this material was within easy striking distance of our deadly enemy Japan.

"Fortunately for us, certain government agencies, importers and private manufacturing concerns had already made a few plans to be used in the then-remote case that our rubber supply should be cut off."

Continued on page 26



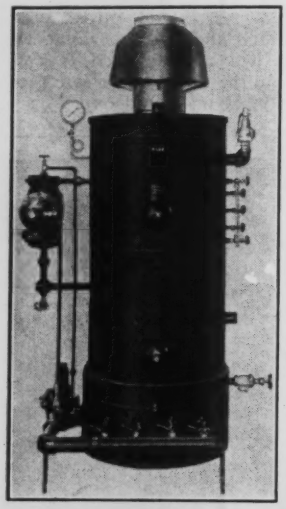
AMERICAN AIR FILTER COMPANY, INC. 103 Central Avenue, Louisville, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.



STEAM as you want it... when you want it

★ ★ ★

KANE AUTOMATIC GAS-FIRED BOILERS



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Conforms to A.S.M.E. Code for 100 lbs.

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Boilers for higher pressures built to order.

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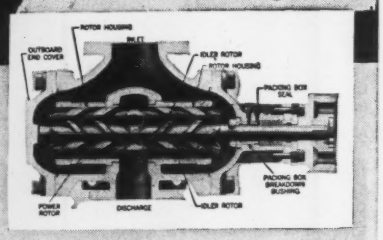
M-K-O Boiler Feed and Return Systems.

MEARS KANE O'NEILL
Manufacturers of Automatic Steam Boilers for over a third of a century
1903-1915 EAST HAGERT STREET, PHILADELPHIA 25, PA.

IMO OIL PUMP

Easy to pack



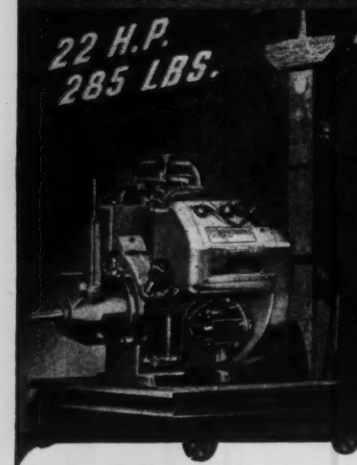
The De Laval-IMO rotary displacement pump for fuel and lubricating oils has only one stuffing box. It has been designed with the operator's problems in mind. Ease of packing is only one of the important and exclusive features.

Ask for Catalog I-114

IMO
I MOVE OIL

IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton 2, New Jersey

WISCONSIN *Air-Cooled* **ENGINES**



Check for
WEIGHT and POWER
ON YOUR EQUIPMENT

As a built-in power unit on portable or mobile equipment, you'll have to look a long time before you can out-point this Model VE-4, V-type, 4-cylinder, Wisconsin Air-Cooled Engine.

This husky heavy-duty "lightweight" checks in at 285 lbs. and delivers 22 hp. at 2600 rpm. Other Wisconsin Air-Cooled engines (from 1 to 31 hp.) are equally adaptable to a great variety of applications where lightweight is wanted, without sacrificing heavy-duty serviceability.

WISCONSIN MOTOR
Corporation
MILWAUKEE 14, WISCONSIN, U. S. A.
World's Largest Builders of Heavy-Duty Air-Cooled Engines

• Keep Informed

Mr. Bitter pointed out that groundwork was laid in May of 1941 for a governmental project for the manufacture of synthetic rubber.

Our situation on July 1st, 1942, after Japanese occupation of Malaya and Dutch East Indies as analyzed by the Baruch Committee was reported by Mr. Bitter.

Mr. Bitter said that the fluctuation of prices for South American Para rubber stimulated enormously the development of Far Eastern plantations and rubber substitutes. He brought out that while Germany, impelled by the blockade of World War I, had produced the first commercial synthetic rubber, types of the synthetic made in the United States are now far superior and that present Nitrile types, such as the Hycar synthetic produced by his company, are the most essential of all rubbers manufactured.

"These rubbers," he said, "make our aircraft self-sealing tanks possible. They are the high heat and oil-resistant products which are so indispensable to the design engineer. They serve their period of usefulness in the inner working parts of machinery or concealed from view in the gasoline hose tubes or in the form of grommets, seals, packing, gaskets and innumerable other parts where, in view of the critical nature of the operation, failure must be avoided."

While he admitted that there has been considerable criticism of the quality of some synthetic rubber articles, particularly tires, he pointed out that it took 20 years' development to extend the service of the natural rubber tire from 7500 miles to 40,000 miles. In contrast to this, he said that passenger car synthetic tires in the past three years have been developed to the point where some have delivered 43,000 miles of service operating at 40 miles per hour.

"The present butadiene-nitrile type synthetics," he said, "are filling a need which has always existed during the entire life of natural rubber. They were being manufactured in substantial quantities and sold prior to Pearl Harbor at prices three times that of natural rubber."

After describing in detail the methods of producing synthetic rubber and discussing the various types, Mr. Bitter predicted continued development of the synthetic following the war solely on the basis of its established superiorities over the natural product.

"Tree rubber," he concluded, "is not being challenged for its right to existence, nor should the return of natural rubber cancel the progress of the synthetic product. It is difficult to believe that the American people, with memories of gasoline rationing and frayed tires fresh in their minds, will permit synthetic rubber manufacturing equipment to be consigned to the scrap heap."

Stop Nut Output Reaches New Peak

Union, N. J.—Self-locking stop nuts used in great quantities by all U. S. plane makers are now being produced at the highest rate in history, William T. Hedlund, president of the Elastic Stop Nut Corp. of America, announced recently.

"The company's production for a single month, well in the hundreds of millions of units, is almost double the monthly production six months previous, and triple the rate for the same month a year ago," he said. The announcement was made in conjunction with production awards to employes.

The rapid increase in output was credited to enlarged manufacturing facilities, including the acquisition of several new plants,

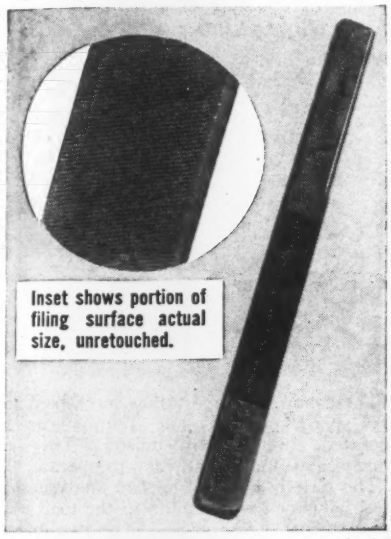
• Keep Informed

and an encouraging step-up in individual production.

Presenting employes with awards signalizing the new production record, Mr. Hedlund said, "We made this mark not only because we all know our jobs, but because we have all done them faithfully and well."

Kennametal Files

Kennametal Inc., 153 Lloyd Avenue, Latrobe, Pennsylvania, has developed, and is now marketing, a new and revolutionary type of file made of the same hard, high strength cemented carbide compositions as the well-known steel-cutting Kennametal lathe and boring tools.



Inset shows portion of filing surface actual size, unretouched.

This file distinctively meets a present day need. Lathes have been "revved up" to the speeds necessary for efficient, enduring performance of carbide-tipped cutting tools, and the ability to file revolving work pieces without reducing speed is a valuable aid to maintenance of production. Ordinary steel files, when used to remove burrs, for example, will break down at these high cutting speeds.

Extended service trials have demonstrated that the new Kennametal file will permit filing speeds of 3 to 10 times that possible with steel files, and outlast them 50 to 200 times. It will cut steels of a hardness up to 62 Rockwell C, which the ordinary file will not touch, and does a noteworthy job on cast iron and brass at surface speeds around 900 feet per minute. High-carbon, high-chromium steels have been filed at 800 s. f. m. with the files in good condition after three weeks of use, compared to steel files lasting only one day on this work.

At the present time, Kennametal files are available in one size, called the F76. It is 11″ long, 3/4″ wide, and 3/8″ thick, having a substantial filing surface 4″ long, made of grade K4H Kennametal (80.6 Rockwell C), single cut with teeth at 30° shear angle, 40 per inch. Convenient grips for the operator's hands are provided. This file is priced at $15.00 in lots of 1 to 9, $13.00 in lots of 10 to 99, and $12.50 in lots of 100 or more.

New Simplex Hydraulic Jacks Meet Urgent Industrial Need

Moving heavier weights faster is the urgent requirement of industry and transportation in the war effort, and to meet the need, Templeton, Kenly & Co., Chicago, has added tandem-pump, Simplex 30-ton and 50-ton hydraulic jacks to its line. Up to this time, a 20-ton capacity was the

Continued on page 28

THREE YEARS OF CALLING ATTENTION TO SAVING CHROMIUM

This advertisement ran in 1941

SAVE CHROMIUM

HELP NATIONAL DEFENSE

You can save chromium for defense and save money in your own plant by using our Chrom Glucosate. You are wasting chromium, badly needed in our National Defense program, when you use it for corrosion control instead of chrom glucosate.

Look at this table of comparison. It tells a commanding story.

COMPARATIVE CHROMIUM CONSUMPTION USING GLUCOSATES AS COMPARED TO CHROMATES

Amt. in form of Glucosate	Amt. as dichromate	Application	Saving
	SODIUM BICHROMATE		
17 pounds	100 pounds	Calcium Brine	83 lbs.
17 pounds	200 pounds	Salt Brine	183 lbs.
34 pounds	500 pounds	Cooling Water	466 lbs.
	CHROMIC ACID		
3 pounds	66 pounds	Calcium Brine	63 lbs.
3 pounds	132 pounds	Salt Brine	129 lbs.
10 pounds	330 pounds	Cooling Water	320 lbs.

Write for our "Organic Methods of Scale & Corrosion Control" "Water Studies."

Help us to stop the waste of chromium ore. Switch to Chrom Glucosate at once and tell your business acquaintances the story of Chrom Glucosate too.

WATER CONSULTANTS

D. W. HAERING & CO., INC.

GENERAL OFFICES: 205 West Wacker Drive

CHICAGO, ILLINOIS

PUTTING A NEW "HEX" ON PRODUCTION PROBLEMS

The ROL-TOP "hex" nut is a new application of the Boots principle of self-locking nuts which assure vibration-proof connections.

Because of the recognized efficiency of the ROL-TOP, design engineers are specifying it for application wherever self-locking devices are desirable.

Specially planned and built for heavy duty, the ROL-TOP Nut resists heat, air, gasoline and other destructive elements which make ordinary non-metallic devices inapplicable.

Boots one-piece, all-metal, self-locking nuts pass all government requirements.

SEND FOR CATALOGUE

BOOTS

BOOTS AIRCRAFT NUT CORPORATION ★ GENERAL OFFICES, NEW CANAAN, CONNECTICUT

SIMPLICITY OF DESIGN MEANS EASIER MAINTENANCE . . .

LENDING A HAND *to the* MAINTENANCE MAN

● He can use plenty of help these days . . . his job of keeping the machinery of production going takes all he can give it. And among his most vital needs are valves that won't take a lot of costly time out for repairs . . . valves that he can depend on for uninterrupted performance.

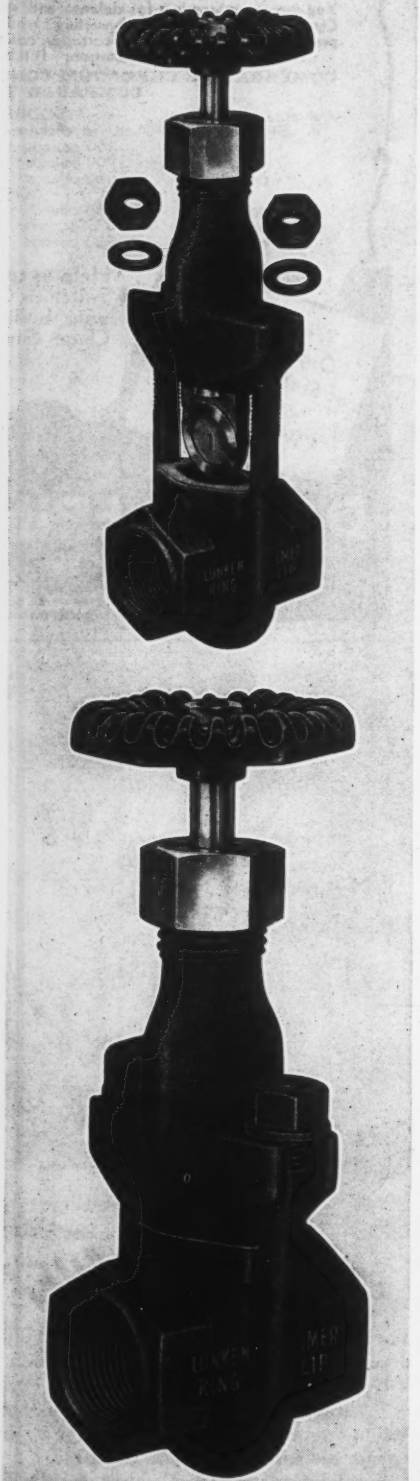
Such a valve is the Lunkenheimer "King-clip". Simple in design, exceptionally sturdy in construction, the "King-clip" is at its best when the going is tough. Also, it's a valve that lends itself to easy maintenance.

Note the illustration. See how easily the "King-clip" can be taken apart . . . how it simplifies maintenance. And when repairs are necessary, you can be certain that any replacement part will fit accurately—Lunkenheimer precision-gauged manufacture gives you that assurance.

Let your Lunkenheimer distributor help you with your maintenance, repair and operating problems. His facilities are at your call.

YOU CAN TAKE IT APART IN A JIFFY . . . . . .

Simply unscrew two nuts at top of clip and entire bonnet-stem-disc assembly can be lifted from the body with complete accessibility for inspection or repairs.



ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI 14, OHIO, U. S. A.
NEW YORK CHICAGO
BOSTON PHILADELPHIA
EXPORT DEPT. 318-322 HUDSON ST., NEW YORK 13, N. Y.

LUNKENHEIMER VALVES

• Keep Informed

largest hydraulic jack made by this company. These new jacks are playing an important part in shipyards, railroad yards and industrial plants, especially where cranes are not available.

These powerful hydraulics have high and low speed pumps. The pumps can be operated singly or in unison. They are sturdy, dependable and easy to operate.

The base is made of special analysis solid steel bar stock which adds to the load bearing security. The jacks have two release valves located on opposite sides of the base for the convenience of the operator. Either release screw controls ram return. The easy carrying grip is an integral part of the high speed pump. They can also be carried by two men by simply inserting the jack lever through both pump handle sockets.

Model 30HJ—capacity 30 tons; low height 11″; hydraulic lift 7″; weight 65 pounds.

Model 50HJ—capacity 50 tons; low height 12″; hydraulic lift 7″; weight 115 pounds.

Shortage?

With so much talk about the need for *more* ball bearings in the war one would imagine that not so many were being produced.

The management of New Departure Division of General Motors, divulged today that in the months of November and December 1943, that company *alone* made more ball bearings than it produced during the *whole four years* of World War I! Actual figures are, of course, a military secret.

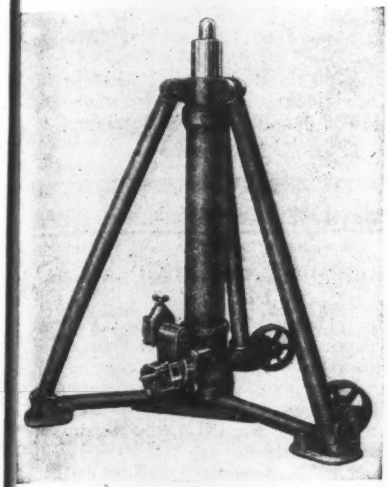
This is eloquent commentary on the increased use of ball bearings in mechanized warfare and emphasizes the super-human efforts that are being exerted.

New Duff-Norton Airplane Jack No. SK-1410

A new mechanical Wing Jack for servicing and repairing airplane landing gears and for other undercarriage work has been developed by The Duff-Norton Manufacturing Company. Designed for easy portability, the SK-1410 is equipped with a collapsible tripod which is quickly folded down for convenient storage in planes. Special hinge stops maintain tripod rigidity under the load.

Keep Informed

This handy new Airplane Jack will carry ads up to 18 tons, and is sturdily built for ntinuous heavy duty. Its closed height is ", and with a raise of 32", it extends to ". The large bearing surface of the legs of e SK-1410 makes the Jack suitable for use soft clay. It may be readily rolled from e place to another by means of 6" diam- er wheels.



To insure safe, even lowering of the load, he Duff-Norton Self-Lowering Governor- Control mechanism is incorporated in the K-1410. With this device, the operator asily and accurately controls the lowering peed by means of a convenient thumb screw t the side of the Jack. No manual work is equired for lowering the load. The Gover- or limits the speed to a safe maximum. s a further precaution against accident, a afety lock is provided on the Self-Lowering echanism so that the Jack cannot be acci- ently lowered.

The fact that the SK-1410 is a mechanical ack further contributes to its safe operation, s the load is raised and lowered on a steel crew. It will not "creep" or settle unex- ectedly. Smooth action of this ball-bearing eared screw Jack makes it ideal for aviation ork.

Further details on Duff-Norton Airplane ack SK-1410 may be secured by writing this ublication, or direct to The Duff-Norton anufacturing Company, Pittsburgh, Pa.

New General Purpose AC-DC Electrode Announced

A new general purpose arc welding elec- rode for welding mild steel in all positions, ith either alternating or direct current, is nnounced by The Lincoln Electric Co., leveland, Ohio.

The new electrode, named "Fleetweld 37", the most recent addition to the well- nown "Fleetweld" group of Lincoln elec- rodes for welding mild and low alloy steels. "Fleetweld 37" was originally designed as n easy striking, unusually smooth operating lectrode primarily for light gauge material. Extensive use in production has also shown it o be a very fast operating electrode under all onditions.

A remarkable feature of the new electrode that there is absolutely no slag interference hen welding vertical down. This means xcellent results are achieved in this position, he one in which greatest welding speeds on to 16 gauge steel are obtained.

The ability of "Fleetweld 37" to with- tand higher currents, both alternating and

Continued on page 30

HI-DENSITY

MICROTOMIC VAN DYKE DRAWING PENCIL

sponsors a

20" SLIDE RULE

Immediately Available—at next to no cost. A circular duplication of a full 20 inch Mannheim slide rule... Precision graduated, and printed on sturdy cardboard. Continuous reading due to circular design... as timely a boon to designers as the blue-printability of tracings made with a Hi-Density Van Dyke pencil!

IMMEDIATE DELIVERY without priority

25c POSTPAID

EBERHARD FABER PENCIL COMPANY
37 Greenpoint Ave., Brooklyn 22, N.Y. M

Here is my 25¢... please mail Slide Rule at once, to

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Street & No. _____

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CASTERS

Reduce Floor Wear to a minimum.

Increase efficiency of employees.

Eliminate wracking of equipment.

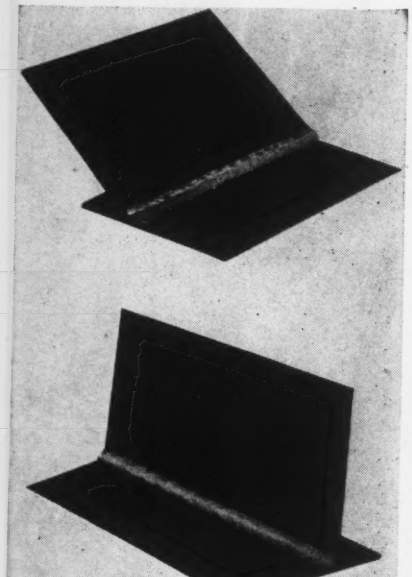
Save time, speed up production.

Write for FREE MANUAL

DARNELL CORP. LTD.,
LONG BEACH, CALIFORNIA,
60 WALKER ST., NEW YORK, N.Y.
36 N. CLINTON, CHICAGO, ILL.

• Keep Informed . . .

direct, makes possible higher welding speeds than normal and its easy handling characteristics in all positions make it an ideal



electrode for general purpose work. The fact that with proper currents it will neither stick to the work nor burn through makes the electrode especially desirable for light gauge welding.

"Fleetweld 37" has unusual physical properties for this type of electrode. The physical properties of all weld metal specimens are as follows:

Tensile Strength, 70,000 to 80,000 p. s. i.
Yield Strength, 60,000 to 68,000 p. s. i.
Ductility (El. in 2 inches), 18 to 25%

"Fleetweld 37" conforms to American Welding Society classifications for arc welding electrodes E-6012, E-6013, E-7011 and E-7012.

The new electrode is available in the 1/8", 5/32" and 3/16" sizes in 14 inch lengths and is packed in 50 pound standard containers.

The LENS
that assures PRECISION

For either qualitative or quantitative photo-elastic analysis, perfection in the projection lens system is of major importance.

In our new model polariscope of 4¼" clear aperture, the parallel beam is collected by a rear element and condensed through a three component lens of the Cooke system. In the new larger unit (8¼" aperture) a four component lens of the Omnar system is used. *The image is sharp throughout the field, free of aberration, astigmatism, and distortion.*

Literature of new model polariscope now available

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630 Fifth Ave., New York, N. Y.

• BUSINESS CHANGES

Cunningham New Allis-Chalmers Director

James Dalton Cunningham, Chicago, Ill., was recently elected to the board of directors of Allis-Chalmers Manufacturing Co., it is announced by Walter Geist, president. Cunningham succeeds Charles W. Cox, New York, a director since 1913, who resigned because of ill health.

The new Allis-Chalmers director is president of the Republic Flow Meters Co., one of the leading companies in the field of power plant instruments and combustion control equipment. In addition, he is president of the Autogas Co., and the Smoot Engineering Co. He is a director of the Lumbermens' Mutual Casualty Co., American Motorists' Insurance Co., the Public Service Company of Northern Illinois, and the National Association of Manufacturers, and a past president of the Illinois Manufacturers Association.

Cunningham is chairman of the board of the Illinois Institute of Technology, a member of the Western Society of Engineers, and a fellow member of the American Society of Mechanical Engineers.

Heberling Appointed Vice-President Edward Valve & Mfg. Co.

Ralph H. Heberling, for the past two years assistant to the President in charge of manufacturing, has been appointed vice-president of The Edward Valve & Mfg. Co., Inc., East Chicago, Indiana, effective Jan. 1, 1944.

Mr. Heberling, who before joining the Edward organization was for many years a prominent Chicago area manufacturer and consulting engineer, will continue to supervise all manufacturing activities of the Company.

H. C. F. Mockridge Elected International Nickel Director

H. C. F. Mockridge, of Toronto, member of the law firm of Osler, Hoskin & Harcourt, was elected a director of The International Nickel Co. of Canada, Limited at the monthly meeting of the Board, Robert C. Stanley, Chairman and President, announced.

Mr. Mockridge fills the vacancy on the Board caused by the recent death of Britton Osler, K. C., outstanding Canadian Corporation lawyer, who had been a director of International Nickel for over 21 years.

After his graduation from Princeton University, Mr. Mockridge studied law at Osgoode Hall, Toronto. In 1927 he became associated with Osler, Hoskin & Harcourt, who are Canadian counsel for the Nickel Company. Since that time he has taken a prominent part in guiding the legal affairs of The International Nickel Co. of Canada, Limited.

• Keep Informed

He resides at 14 Ardmore Road, Toronto, and is a member of the University and Toronto Clubs of that city.

Donze Becomes Timken Vice-President in Charge of Production

A. M. Donze, Factory Manager of The Timken Roller Bearing Co., Canton, Ohio, for the past eight years, has become Vice-President in Charge of Production. The advancement was made at a meeting of the board of directors held December 18, 1943, and was immediately effective.

At the same time, H. M. Richey, Assistant Factory Manager, was promoted to Factory Manager.

Donze, a native of Cleveland, Ohio, has been with the Timken Company since 1919. In 1921, after several progressive steps, he became Production Manager of the bearing factory; in 1934 was appointed Factory Manager; and in 1940 was elected a director of the Company. He is a 1914 graduate of John Carroll University, with an A.B. degree.

Richey, a native of Bremen, Ohio, joined the Timken Company in 1916, beginning as an assistant foreman. He became Assistant Factory Manager in 1940.

Paul Reeves Appointed Advertising Manager Timken Roller Bearing Co.

The Timken Roller Bearing Co. announces the appointment of Paul Reeves as Advertising Manager to succeed Roland P. Kelley who has occupied that position for the last seventeen years, and who has resigned to go into advertising agency work. Mr. Reeves is a native of Dover, Ohio, attended Staunton Military Academy and is a graduate of Carnegie Institute of Technology with a degree in Mechanical Engineering.

He came with the Timken Company in 1929 and after completing the Timken engineering training course served as Sales Engineer in the Chicago office of the company. He was subsequently transferred to the Pacific coast where he was made Industrial District Manager of the company's San Francisco Branch.

In 1940 he was brought back to the home office in Canton, Ohio, as Sales Promotion Manager, but when this country entered the war, he was put in charge of government priorities to handle contacts between the company and Washington.

Westinghouse Names Product Design Manager

Ralph E. Kruck, who has designed everything from baby carriages to refrigerators, has been appointed manager of the Product Design Department of the Westinghouse Electric Appliance Division.

An industrial designer for Westinghouse since 1931, Mr. Kruck will have the job of "appearance designing" electric ranges, automatic laundering machines and all other appliances the company builds after the war. His headquarters will be at the company's plant in Mansfield, Ohio, working closely with the engineering, sales and advertising departments.

Before assuming his new position Mr. Kruck was a member of the engineering department at the Westinghouse East Springfield, Mass., plant where he designed household and commercial refrigeration and air conditioning equipment and even factory buildings and auditoriums.

Mr. Kruck's appliance designs earned him the Westinghouse Order of Merit two years ago. The award, voted by the Board of Directors, was in recognition for "dis-

Continued on page 32

Another KENNAMETAL *First!*

New KENNAMETAL Lathe File Produces Sensational Results

KENNAMETAL F-76

...ENNAMETAL LATH... ...ish new standards of efficiency an... ...he filing of steel and other metals. For ...

★ KENNAMETAL Lathe Files permit filing speeds of 3 to 10 times that possible with steel files, matching the unusually high cutting speeds of KENNAMETAL carbide tools.

★ KENNAMETAL Lathe Files do not burn up at high speeds but outlast steel files 50 to 200 times.

★ KENNAMETAL Lathe Files cut hardened steels up to 62 Rockwell C which the ordinary file will not touch . . . do a noteworthy job on cast iron and brass at surface speeds around 900 feet per minute, and efficiently file high-carbon, high-chromium steels at 800 surface feet per minute.

PATENT APPLIED FOR

At present, KENNAMETAL LATHE FILES are available in one size—Style F-76, illustrated. It is 11" long, ¾" wide, and ⅜" thick, having a substantial filing surface 4" long of grade K4H KENNAMETAL (80.6 Rockwell C), single cut with teeth at 30° shear angle, 40 per inch. Shank is shaped for convenient handling.

PRICES
1 to 9 files . . . $15.00 each
10 to 99 files . . . $13.00 each
100 or more . . . $12.50 each
F.O.B. Latrobe, Penna.

SUPERIOR CEMENTED CARBIDES

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The Facts You Want On

MODERN TURBINES

Edited by LOUIS E. NEWMAN, Turbine Division, General Electric Co., Schenectady, N. Y.

Written By:

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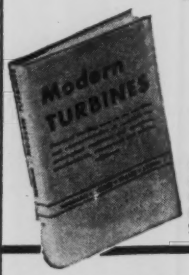
ALLEN KELLER,
JOHN M. LYONS,
LAWRENCE B. WALES,

—All with the General Electric Company



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Men who work with Turbines want FACTS. Briefly, then, it can be stated that MODERN TURBINES is one of the best and most comprehensive books available on all kinds of steam turbines and generators, whether activated by liquid, gas, or vapor.

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These helpful practical features and labor-saving suggestions are included:

- **How to arrive at a method that works for rejuvenating worn-out turbines**
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- **How to lay out a new power plant, or re-condition an old one**
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ME-2-44

tinguished service, particularly for his creative work in the field of industrial design; for his ability to create designs adaptable to practical manufacture, and especially for his creation of new standards of beauty in the field of household refrigeration."

Appointed to take Mr. Kruck's place at the Westinghouse plant in East Springfield was Anthony Naiden, a design engineer who has been associated for the past eight years with advertising agencies of New York.

Wedereit Now Tube Turns and Girdler Advertising Manager

Tube Turns and the Girdler Corp., Louisville, Kentucky, announce the appointment of Gene Wedereit as advertising manager. Formerly vice-president, and director of creative service with the E. F. Schmidt Co., of Milwaukee, Wedereit came to Louisville recently as a result of his work in the designing and production of Tube Turns' 240-page catalog. Walter Girdler, Jr., formerly advertising manager, is now director of personnel.

New Sales Executive for Templeton, Kenly & Co.

A. C. Lewis, associated with Simplex jacks for more than thirty years, has been appointed vice-president in charge of sales of Templeton, Kenly & Co., Chicago, teaming up with P. H. McManus, J. B. Templeton, president, has just announced. Mr. Lewis' appointment is effective January 1, 1944. He will make his headquarters in Chicago, but will maintain contact with Canadian distributors through frequent trips to the dominion.

On joining Templeton, Kenly & Co. in 1912, Mr. Lewis was sent to Toronto to open a Canadian manufacturing plant for Simplex jacks. Just prior to the outbreak of World War I, he made a trip to England and the continent to establish European distribution for the Canadian factory. When Canadian manufacturing temporarily ceased in 1915 and the plant equipment sold, Lewis resigned to form A. C. Lewis Company Ltd., Canadian distributors for Simplex jacks. Manufacturing was continued by William Kennedy & Sons, Ltd., at Owen Sound, Ontario.

Later, Lewis became a British subject and went to France as an officer of the Third Canadian Infantry Batallion, Toronto Regiment, in 1917. He was wounded at Amiens on August 8, 1918 and evacuated to Canada in 1919. Upon being discharged from the hospital, he returned to his business.

In 1928, Railway & Power Engineering Corp. Ltd., took over the assets of A. C. Lewis Company Ltd., including the distribution of Templeton, Kenly & Co. products, Lewis continuing as special representative of the sales department. He recently resigned to assume his new post with the Chicago firm.

Hildorf Now Timken Director of Metallurgy

Walter G. Hildorf, who recently became Director of Metallurgy of The Timken Roller Bearing Co. is the first to occupy that newly created office, according to the Canton, Ohio, firm. Hildorf was formerly Timken's Chief Metallurgical Engineer, a position now held by Ralph L. Wilson.

Hildorf, metallurgical veteran of 35 years' experience, who "worked his way" through Michigan State College via a machine shop, is nationally-known for his numerous articles and lectures on many metallurgical subjects. He joined the Timken Company in 1928, after 20 years' experience with such firms as The Copper Range Consolidated Mining Company and The Reo Motor Car Company. For three of those years, from 1917 to 1920, he was first an instructor and later an Associate Professor in the Metallurgical Department of Michigan State College.

Southeastern United States Representatives Appointed by Edward Valve

Eshelman & Potter, Birmingham, Ala., and Charlotte, N. C., have been appointed representatives of The Edward Valve & Mfg. Co., Inc., for the Southeastern United States.

The appointment, which is effective Jan. 1, 1944, puts the wide experience of a veteran power engineering organization at the disposal of steel valve users of the Southeast. The Edward territory covered by Eshelman & Potter includes North Carolina, South

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RATE **Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.**

• Keep Informed

Carolina, Georgia, Florida, Alabama and eastern Tennessee.

Principal executives of the Eshelman & Potter firm are Joseph W. Eshelman, who directs the Birmingham, Ala., office and James Potter, who heads the Charlotte, N. C., office.

K & M Appoints C. H. Stone

Kieley & Mueller, Inc., North Bergen, New Jersey, manufacturers of pressure and flow control equipment, have appointed C. H. Stone & Co., 45 Arch Street, Boston, Massachusetts, as exclusive representatives in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut. The Stone organization will represent K & M on its entire line of pressure regulating valves, back pressure valves, liquid level controls, strainers, steam traps, float valves, pump governors and power plant equipment for all industrial applications throughout the New England area.

• LATEST CATALOGS

Flux Chart

Anyone interested in welding, brazing or silver soldering will find considerable use for the new Krembs Fluxine Chart . . . . a handy key to finding the best flux to use in connection with a host of metal-joining jobs. The Chart comes in bulletin form, is easy to use and is handy for reference. It gives a list of all the common metals and alloys—and many of the rarer ones—and recommends the most satisfactory flux to use when joining them by different processes. It is sponsored by an organization of welding, and brazing consulting engineers, recognized as authorities in their field. Men engaged in metal-working may obtain a complimentary copy of this chart by writing on their company letterhead to Krembs & Co., 666 West Ohio Street, Chicago 10, Ill.

Porter Steam Locomotives

"Porter Steam Locomotives", a new catalog giving technical data on the most complete line of industrial locomotives built in the United States, as well as railroad switching locomotives, has been announced by H. K. Porter Co., Inc., Pittsburgh, Pa. Latest in a series dating back 75 years to when Porter began locomotive manufacture, the catalog represents an authoritative review of the current field of industrial and switching steam engines. More than 50 locomotive types are illustrated, with complete specifications and performance data given in the majority of cases. Articles on standard specifications, tractive force, and the most modern procedures in locomotive operation are illustrated with mechanical drawings and tables. Porter methods and materials used in locomotive construction from frame to cab are reviewed in the 68-page booklet.

Operation and Maintenance Review

"Allis-Chalmers Operation and Maintenance Review" s a new pocket-sized magazine succeeding Allis-Chalmers' "Victory Production and Maintenance News."

Illustrated with eye-catching color cartoons, the publication aims to broaden interest in problems of wartime maintenance. It contains maintenance tips from Allis-Chalmers engineers, as well as timely articles on current trends for the shopman and the executive. It also invites an exchange of

Continued on page 34

FRASER-BRACE ENGINEERING CO., Inc.

Design, construction and installation of complete plants and projects

Mechanical, Heavy Industries, Shipbuilding, Hydro-Electric Developments, Power Plants, Chemical and Refining Plants, Process Industries, Metallurgical Developments and Processes, Explosives, Plastics, Water Supply and Treatment, Sewage and Industrial Wastes Treatment.

• REPORTS • APPRAISALS • CONSULTING •

10 East 40th Street New York 16, N. Y.

IF YOU WANTED A LOT OF PUMPS FOR SPECIFIC JOBS...IN A HURRY ...WHERE WOULD YOU GO?

Write, stating the type of work you are engaged in, and Goulds will forward you a complete set of literature illustrating and describing the Goulds Pumps that have been developed specifically for your industry. Goulds Pumps are available, if you have a suitable priority rating.

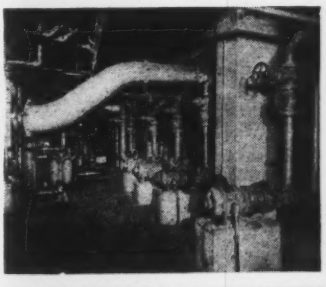
SUPPOSE you were handed the orders for a whole fleet of coastwise tugs, each of which had to be equipped with half a dozen pumps . . . and each pump *had* to be designed for the job it was to do?

Suppose you had the contract for an oil pipe line with a dozen or more heavy duty, high pressure pumps able to stand up under continuous 24 hours a day service?

Or suppose you were completely re-equipping your plant to meet increased production demands and your whole process hinged on the fluid handling efficiency of your pumping system?

Where could you go where you would be sure of getting *the* pumps that were designed to do those specific jobs? Where could you go where you could get any or all of these pumps from the *one source?*

Goulds has the answer to that . . . as it had in the actual cases mentioned here. Out of 96 years of exclusive specialization on pumps and pumping problems Goulds has developed a complete line of pumps designed to meet any pumping requirements, large or small. Because no one pump, nor any one type of pumping equipment, is suitable for all purposes, Goulds, as pump specialists, offer a complete line of reciprocating, rotary and centrifugal pumps in all sizes and capacities, out of which can be selected *the* pump for *the* job.



Goulds PUMPS INC.

SENECA FALLS, N. Y.

Any Way You Look At It...

...the Superiority of Arkwright Tracing Cloths Stands Out!

Many draftsmen prefer Arkwright Tracing Cloths because they're so thin. *One* reason for their matchless transparency! Others prefer Arkwright Tracing Cloths because they blueprint so clearly . . . or because they take erasures without smudging or "ghosting". Try them yourself. You'll see that no matter what you're looking for . . . transparency, sharpness of transfer, erasability . . . the superiority of Arkwright Tracing Cloths always stands out . . . Arkwright Finishing Company, Providence, R. I.

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AMERICA'S STANDARD FOR OVER 30 YEARS

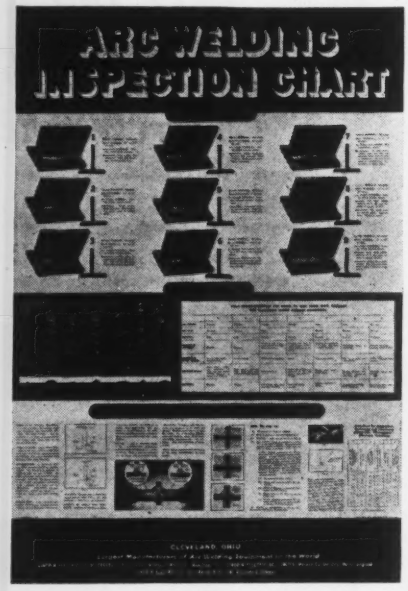
• Keep Informed . . .

ideas on operation and maintenance from equipment users. The "Review" will be issued bi-monthly.

New Weld Inspection Chart Offered by Lincoln

An entirely new and comprehensive arc welding inspection chart, designed so that operators and inspectors can tell at a glance whether welds are being properly made, has just been published by The Lincoln Electric Co., Cleveland, Ohio.

This graphically illustrated chart pictures actual specimens of various results obtained in making fillet and butt welds and describes briefly the appearance and characteristics of proper and improper weld beads, with a brief description of the conditions under which each was made.



A portion of the chart is devoted to a description of the widely used "Fleet-Fillet" welding technique, telling of its advantages, where and how to use, and including a table on the procedure for single-pass horizontal and positioned fillets with "Fleetweld 11" which carries data such as electrode sizes, desired current, burn off rates and arc speed.

The chart should prove extremely helpful to everyone interested in speeding up arc welding production and in achieving the most satisfactory results from his work. It is printed in two colors on a heavy grade of stock measuring 23 inches by 35 inches, and is available without charge to inspectors, operators and others concerned with welding.

"Packaging Pays Off"

"Packaging Pays Off" is the title of a new Allis-Chalmers bulletin describing standardized load center unit substations of 100 to 2000 kva capacity for meeting the power supply needs of all types of industries. The most unique feature of the bulletin is a simple nomogram which makes it possible to select the correct air circuit breaker for any application of a standardized load center unit substation.

Pointed out in this bulletin as advantages of the new load center power distribution system are quicker delivery of equipment, easier installation, critical material saving, and lower initial cost.

Description and illustrations of equipment combinations stress flexibility as a characteristic of standard unit substations. To fit individual needs for protection, incoming line arrangement may be vertical lift switchgear, disconnect switch, function box, oil fuse cutouts, high voltage throat or roof bushings. These may be connected through an oil, noninflammable liquid, or air-cooled transformer to dead front air circuit breaker switchgear. The purchaser may select low voltage breakers which are manually operated, electrically operated, stationary mounted or drawout mounted.

Write Allis-Chalmers Mfg. Co., Milwaukee 1, Wis., for this bulletin B6285.

Interchangeable Ball Bearings for Replacement

New Departure announces the 1944 Edition of "Interchangeable Ball Bearings for Replacement." The book contains numerically arranged lists of ten competitive makes of ball bearings together with corresponding New Departure numbers.

In addition there are four other very helpful sections: 1. A table of New Departure bearing dimensional tolerances according to various ABEC specifications. 2. A section explaining the meaning of prefixes and

COMING MEETINGS AND EXPOSITIONS

During the next three months

FEBRUARY

9–11	American Management Association, Personnel Conference, Palmer House, Chicago, Ill.
10–11	The Engineering Institute of Canada, 58th Annual Meeting, Chateau Frontenac, Quebec City, Canada
14–17	Technical Association Pulp & Paper Industry, Annual Meeting, Commodore Hotel, New York, N. Y.
20–24	American Institute of Mining and Metallurgical Engineers, Annual Meeting, Waldorf-Astoria, New York, N. Y.
28–Mar. 3	American Society for Testing Materials, Spring Meeting, Netherlands Plaza Hotel, Cincinnati, Ohio

MARCH

1–2	American Management Association, Finance Conference, Hotel New Yorker, New York, N. Y.
21–23	Greater New York Safety Council, 15th Annual Convention and Exposition of Safety Equipment, Hotel Pennsylvania, New York
26–28	American Society of Tool Engineers, Annual Meeting, Bellevue-Stratford, Philadelphia, Pa.
28–31	American Management Association, Packaging Conference, Palmer House, Chicago, Ill.

APRIL

2–5	The American Ceramic Society, Inc., Second War Congress and 46th Annual Meeting, Hotel William Penn, Pittsburgh, Pa.
3–5	The American Society of Mechanical Engineers, Spring Meeting, Hotel Tutwiler, Birmingham, Ala.
3–7	American Chemical Society, Cleveland, Ohio
5–7	Society of Automotive Engineers, National Aeronautic Meeting, Hotel New Yorker, New York, N. Y.
	Midwest Power Conference, Palmer House, Chicago, Ill.
25–28	American Foundrymen's Association, 48th Annual Meeting and Third War Production Foundry Congress, Memorial Auditorium, Buffalo, N. Y.

For Calendar of coming A.S.M.E. Meetings see page 142 in the editorial section.

Keep Informed

suffixes used with each make of bearing. 3. Comparative bearing type and series numbering systems. 4. Interpretation of New Departure bearing numbers for applying numerical designations to various bearing characteristics.

A copy may be had free on request to the Advertising Department, New Departure Div. of General Motors, Bristol, Conn. Simply ask for Booklet R.

Meehanite Milling Cutter Bodies

A new booklet describing Farrel Meehanite milling cutter bodies has been issued by Farrel-Birmingham Co., Inc., Ansonia, Conn.

Furnished as unfinished castings, these cutter bodies are available in a number of different shapes and sizes to shops equipped to machine the bodies and braze on their own cutting tips. By carrying a number of castings in stock, the most suitable cutter can be prepared for any given job.

The booklet describes advantages of design, tells why Meehanite is most suitable for the purpose, and explains procedure for preparing the cutter bodies for use and applying the cutting tips. Also included are tables of sizes, shapes and dimensions for both milling cutter bodies and single point tool shanks.

A copy of this timely bulletin can be obtained without charge upon request to the editor or directly to Farrel-Birmingham Co., Inc., Ansonia, Conn.

Pease 1944 Calendar of Greater America

The C. F. Pease Co., Chicago, have just published and mailed their beautiful, full color, 1944 Calendar of Greater America. It is timely, appropriate, and the message it carries should strike a responsibe chord. The six sheets, 16 × 19½ inches, each sheet bearing calendars of two months, are printed in five colors.

The Calendar of Greater America is an original and exclusive Pease promotion. It has for its theme: America will fulfill her national destiny—to lead the world in industry, commerce, agriculture, transportation and science and to contribute to world betterment—through new inventions, new construction, improved products and finer values. From the standpoint of subject matter, as well as artistic handling, it is the finest they have ever produced and ranks high among calendars distributed by other industrial companies.

Each of the six pages has received individual treatment. A different glamorous beauty is shown in full color on each page and each background is a beautiful illustration in color envisioning anticipated developments in an important industry served by Pease. Below the illustration concise copy gives added meaning to the idea portrayed, while Pease Blueprinting Machines are advertised by a small half-tone illustration and brief descriptive copy, the only advertising with the exception of the company name and identification across the bottom.

Synchronous Motors and Control for Compressor Drives

Low-speed synchronous motors and control for compressor drives are featured in a new 4-page bulletin (GEA-4139) recently issued by the General Electric Co.

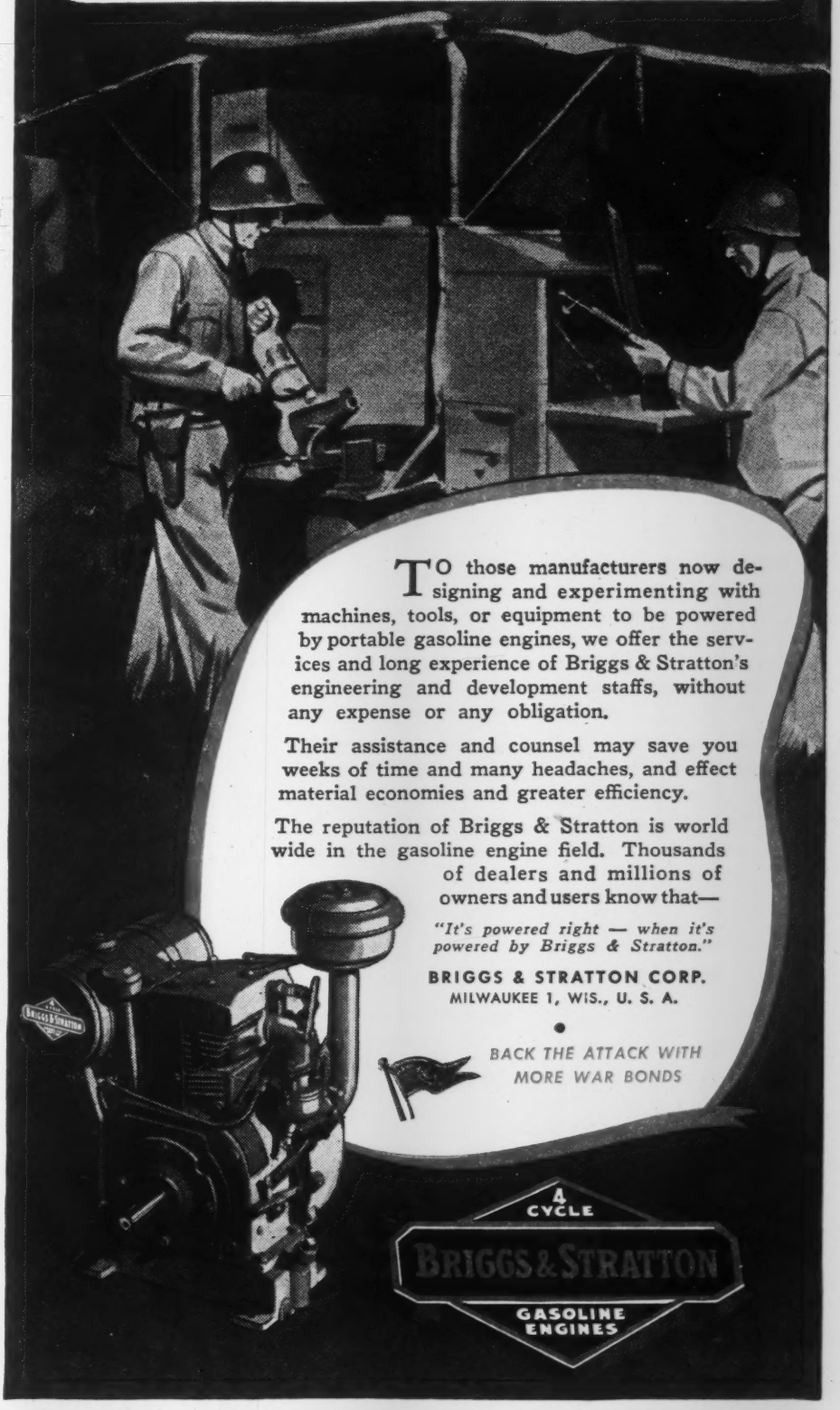
The well illustrated publication describes the application of low-speed synchronous motors, emphasizing the necessity of providing in the installation the proper amount of flywheel effect to avoid excessive current pulsations; lists the most important con-

Continued on page 36

A Mobile Service...

FOR ANY GUN — PISTOL TO HOWITZER

"Keep 'em Firing"—no matter where they are. That's the slogan. Repair crews, with their mobile workshops, service all types of guns, from pistols to howitzers. Generating units, powered by gasoline engines, charge batteries and operate electric drills and other modern tools. This is typical of the multitude of vital jobs — both standard and special — for hundreds of thousands of rugged, dependable Briggs & Stratton engines "in the service."



TO those manufacturers now designing and experimenting with machines, tools, or equipment to be powered by portable gasoline engines, we offer the services and long experience of Briggs & Stratton's engineering and development staffs, without any expense or any obligation.

Their assistance and counsel may save you weeks of time and many headaches, and effect material economies and greater efficiency.

The reputation of Briggs & Stratton is world wide in the gasoline engine field. Thousands of dealers and millions of owners and users know that—

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BACK THE ATTACK WITH MORE WAR BONDS

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GASOLINE ENGINES

struction features, especially in respect to the rotors and stators; and discusses the synchronization, field removal, and motor protection afforded by the G-E synchronous motor control.

Carrier "Problems and Solutions"

Syracuse, N. Y.—Reviewing forty-two years' experience in industrial installations of temperature and humidity control equipment Carrier Corp. issued this month a brochure delineating a few of the problems which engage the industry.

The brochure is called "Problems & Solutions." It was prepared for distribution to plant managers, plant engineers, process engineers, plant superintendents and research laboratories.

Illustrating the problem of tempering steel for uniform hardness Carrier reports the method used in breaking a production "bottleneck" through temperature control of solution in the tanks in which steel knives are quenched.

Further illustrations describe the problems encountered in the plastics industry where resins are unworkable under certain atmospheric conditions.

The most spectacular solution reported in the brochure is that described as "cooling by the acre" at the huge Wright Aeronautical Corporation plant where four Carrier centrifugal refrigeration machines cool 12,000 gallons of water per minute to 47 degrees F. The cooling water is distributed through coils to the main manufacturing area and office building.

In all, specific problems and solutions in 8 industries are presented, the fields covered being steel manufacture, the plastics, aviation, drug, cosmetic, dehydration, glass and munitions industries. Copies of the brochure may be had by writing to Carrier Corp., Syracuse, New York.

Hydraulic Plastic Molding Presses

"Hydraulic Plastic Molding Presses" is the name of a new bulletin (No. 5,000) recently issued by the Elmes Engineering Works of Chicago 7. This bulletin describes the presses used for compression and transfer molding processes; namely, (1) the hand molding press, (2) the semi-automatic press and (3) the transfer molding press. It describes the controls of these three presses, their sources of power, and their construction. Cross-section illustrations of press operations are shown; also photographs of the three types of press construction.

Fundamentals and Applications of Electronic Control Discussed in New General Electric Publication

The fundamentals and the various applications of electronic control are interestingly described in a new 12-page bulletin (GEA-4126) recently issued by the General Electric Co.

Well illustrated, the publication explains in clear, simplified language the fundamental principles of electronic tubes and their operation, describes the construction of the well known thyratron tube, and lists the functions of eight of the more widely used industrial-type tubes.

The publication also describes and illustrates many practical applications of electronic control, including rectification, resistance welding, timing, and processing operations, as well as photoelectric installations involving counting, sorting, weighing, measuring, registering, illumination, and the control of cement kiln temperatures. Many of these applications have been in successful operation for a decade or more.

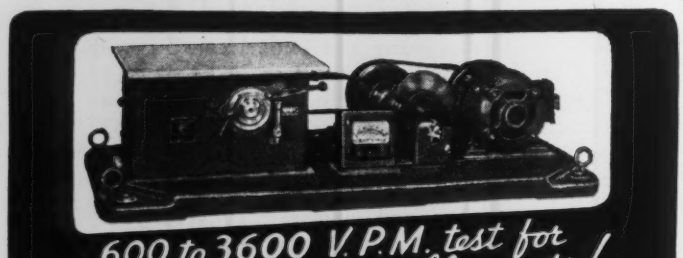
Also listed in the publication are the various advantages afforded by the use of electronic control, such as flexibility, precise control, reduced maintenance, and quiet, faster, automatic operation.

New Departure Issues New Service Book

Because they are a vital necessity in practically all kinds of fighting equipment, ball bearings have become one of today's "hard to get" items, Thus it is more important than ever before to get the utmost service out of ball bearings in all equally vital home front equipment.

By using the correct methods of handling bearings when overhauling equipment, it is possible to keep a great many in use that otherwise might be damaged or unnecessarily discarded.

To help both trained men and those of lesser experience a new booklet entitled "Service Procedure for Ball Bearings" has been written to give in simplest terms all of the steps from dismounting, cleaning, judging condition, to remounting, fully described and illustrated with drawings and photographs. Copies of this book in any reasonable quantity may be had free by addressing New Departure Division, General Motors Corp., Bristol, Conn. Ask for booklet ND. A57.



ELECTRONIC, aircraft and electrical parts and assemblies up to 100 lbs. in weight can be readily subjected to continuous or intermittent vibration fatigue test—the test that answers many questions about engineering, design and construction materials —on the **Model 100A All American Vibration Fatigue Testing Machine.**

Simulates all of the vibration conditions actually encountered in service. Frequencies from 600 to 3,600 vibrations per minute, recorded on accurate electric tachometer. Frequency can be changed manually or by an automatic device which changes cycles from 10 to 55 and back, uniformly and continuously. Requires no attention; no water cooling; quiet.

Send for Catalog "F" — shows all models and contains treatise on vibration fatigue testing.

ALL AMERICAN
Tool & Manufacturing Co.
1014 Fullerton Ave., Chicago

High Pressure IN A COMPACT PACKAGE!

Specify TUTHILL MODEL CK PUMPS *for dependable Service!*

The compact design of Tuthill Model CK High-Pressure Pumps makes them ideal for service on machine tools, engines and hydraulic mechanisms. These internal-gear rotary pumps save space, material and money. Sizes from 1 to 50 g.p.m., pressures up to 400 p.s.i. Furnished with direct motor drives, V-belt units and integral drives. Write for Model CK catalog.

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• Keep Informed . . .

Announcements in this section are supplied by current advertisers in MECHANICAL ENGINEERING and A.S.M.E. MECHANICAL CATALOG. This section is restricted to these advertisers.

- *NEW EQUIPMENT*
- *BUSINESS CHANGES*
- *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

General Electric Announces New Helium-Shielded Arc-Welding Electrode Holder

A new helium-shielded arc-welding electrode holder for manual operation has been announced by the Electric Welding Division of the General Electric Co. The new holder, which may be used with either helium or argon gas, is specially designed for use in the welding of light metals, such as magnesium and its alloys, where precise heat control and protection from the oxidizing effect of the air are required. It can also be used in the welding of other hard-to-weld metals, such as aluminum and stainless steel.

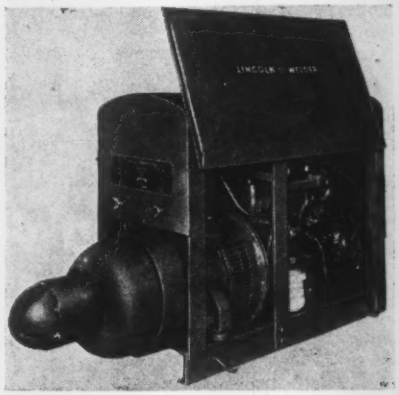
The holder is light and consists of a comfortable Textolite handle, a steel gas nozzle, and a copper electrode clamp fitted with a tool steel spring-collet. The gas nozzle is designed to give maximum coverage with minimum gas consumption, and to avoid obstructing the operator's view of the arc. A fixed angle of 76 degrees between the nozzle and the handle contributes to the balance and "feel" of the holder. The electrode clamp is constructed to hold a tungsten or a carbon electrode until all but a 3/4-inch stub is consumed. The holder may be laid down without arcing, since the handle, gas nozzle, and electrode clamp are fully insulated.

A button for controlling the gas supply valve is located on the handle of the holder, where it is convenient to the operator's thumb. This button will remain in either the ON or OFF position without being held. It also operates the valve in intermediate positions, thus providing smooth, stepless control of the gas flow and enabling the operator to conserve helium when welding in a corner or a depression.

A feature of the new holder is the tapered friction joint between the electrode clamp assembly and the handle, which facilitates rapid change of electrode size without using tools or making threaded connections. Electrodes of various sizes may be left in their respective clamps and substitution made merely by removing one assembly from the handle and slipping on another.

Lincoln Announces New Model Engine Driven Arc Welder

A new "Shield-Arc" engine-driven welder rated at 200 amperes of light weight, rugged construction with powerful enclosed, rubber mounted engine of 29 horsepower, is announced by The Lincoln Electric Co., Cleveland, Ohio.



This new unit, supplied complete with base and canopy (see accompanying photograph) has a current range of 40 to 250 amperes. Dual control of welding current is accomplished by adjustment of series fields and generator speed.

For metallic arc welding, with bare or coated electrodes, the new model also supplies uniform welding current for carbon arc welding.

The generator control or "job selector" assures accuracy of open circuit voltage and permits precise control of engine speed of from 1,500 to 1,150 revolutions per minute for welding. In addition, this control may be used to manually reduce the engine speed to as low as 750 revolutions per minute whenever it is necessary to stop welding at intervals of a few minutes. This feature not only permits adjustment of engine speed to fit the individual job, but also affords improved welding and keeps down fuel consumption and engine wear.

With this new unit an engine speed of from 1,150 to 1,400 revolutions per minute is used for the majority of welding applications being considerably lower than that of conventional engine-driven welders thus assuring longest possible life of the equipment.

The generator can produce its rated current of 200 amperes when the "job selector" is set so that the machine operates at speeds as low as 1,200 revolutions per minute.

Weight of the unit as illustrated is approximately 1,130 pounds. Overall length, 65 1/4 inches; width, 24 inches and height, 41 1/2 inches. Illustrated bulletin number 312-C, describing this new welding unit, is available on request.

Pangborn Industrial Type "CK" Unit Dust Collector

Pangborn Corp. announce their new Industrial Type "CK" Unit Dust Collector, which is illustrated and described in their Bulletin No. 910 which has just recently been placed on the market.

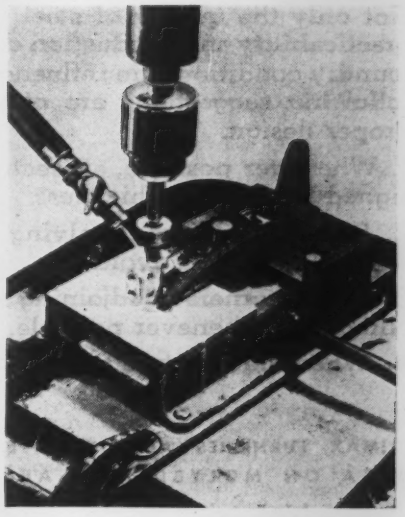
This new self-contained Unit Dust Collector provides construction and performance consistent with the requirements of industrial operations and should not be confused with the numerous small, lightly constructed, low volume units now on the market.

Features and construction specifications, together with the capacities and dimensions, of the three sizes available are completely covered by Bulletin No. 910. Of particular importance is the flexibility in arrangement permissible for adaptation to specific plant conditions.

There has long been a need for a real Industrial Type Unit Dust Collector for smaller air volume dust control problems.

Mead Announces the New "Flat Top" Work Holder

A simplified new type of fixture for holding small flat work for toolroom use and certain other types of production operations has just been announced by the Mead Specialties Company, Chicago, Ill. It was developed to overcome difficulties encountered in drilling, countersinking and tapping small precision parts in which highly accurate perpendicularity was essential. This difficulty is instantly eliminated by the new type Mead "Flat Top" Work Holder.



This fixture is instantly ready to hold any type of work which is flat on the bottom, varying in thickness from a few thousandths up to a couple of inches, and in area from the size of a dime up to several inches square. The peripheral contour of the work makes no difference.

Continued on page 29

Information supplied by an Industrial Publication

Not only the quality of steel castings, but their practicability and production cost under ordinary foundry conditions are influenced by design. The following suggestions are offered as an aid to proper design.

1. Whenever possible, all sections should be designed for uniform thickness.

2. Structural design involving abrupt changes in section should be avoided.

3. Sharp corners at adjoining sections should be eliminated whenever possible.

4. When the structure becomes very complicated, it is better to break it into several components that can be cast separately and assembled by welding or bolting.

5. In designing unfed sections in "L" or "V" shapes, it is suggested that all sharp corners at the junction be replaced by radii so that this section becomes slightly smaller than that of the arms.

6. In designing sections that join to make an "X", it is suggested that two of the arms be offset considerably.

7. In the case of unfed "T" and "X" sections, the radii at the junctions should be relatively small.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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Climax Molybdenum Company

500 Fifth Avenue • New York City

MOLY

But the utility of the "Flat Top" fixture is not limited to drilling and tapping operations alone. It is also ideal for many operations on small shapers and bench milling machines. One of the supporting plates is perforated and provided with three studs. This end of the fixture is used for milling and shaping work. Two studs are set in position to locate the back of the work, and the third is set at the end to support the work against the pressure of the cutting tool. It is instantly apparent that this arrangement automatically makes a high-speed precision fixture for production work. The "Flat Top" is in actual fact a universal jig which can be changed from one set-up to another by the ridiculously simple process of dropping three studs into three holes! Adjustment for work thickness is made by simply turning the knurled head of the ball-joint stud!

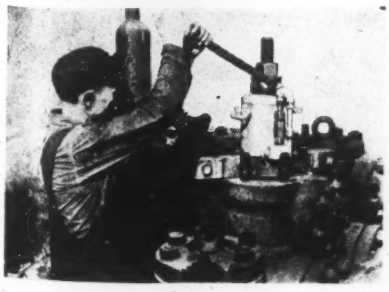
Brown School Will Stress Electronic Potentiometer Instruction in New Course

A new industrial instrument maintenance and repair course was started on February 1st by the Training School Division, of The Brown Instrument Co., Philadelphia, Pa. Changes have been made in the general outline of the course, especially that having to do with instructions in the two types of potentiometers, mechanical and electronic. The two types will be treated as separate subjects to make it easier for students to absorb the basic principles of each, and to meet the requirements of those customers who send students to the school for the specific purpose of receiving continuous balance instrument instruction.

The new classes will extend to April 26. Millivoltmeter type pyrometers will be studied from February 1 to 18; mechanical potentiometer type potentiometers, from February 21 to March 8; continuous balance (electronic) potentiometers, March 9 to 16; electrically operated automatic control, March 17 to 23; flow meters, March 24 to April 3; thermometers, pressure gauges and hygrometers, April 4 to 11; air-operated automatic control, April 12 to 20, and resistance thermometers and tachometers, from April 21 to April 26.

New Hydraulic Puller Greatly Reduces Time Required for Tough Jobs

The Simplex Jenny Center Hole Hydraulic Puller, recently introduced by Templeton, Kenly & Co. was designed to accomplish in minutes production, maintenance and repair jobs which normally require hours.



This unit has performed allegedly impossible tasks in general industry, construction, shipbuilding, mines, railroad shops and in the oil fields. It has also been used for pulling in utility service pipe. Applications include pulling bushings, cylinder liners, cutless bearings, pistons, wrist pins, valve seats, keys, wheels, sprockets, gears, boiler tubes and pipes. It is also used to pull structural members together for welding or riveting.

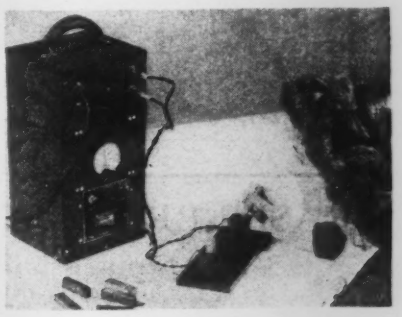
The Simplex Jenny pulls, pushes or lifts; and can also be readily rigged up as a portable press. This self-contained unit operates vertically or horizontally without the need for heavy auxiliary equipment, and without side thrust or friction. The Jenny is its own back-up and is self-supporting because of its center hole construction.

Five models are available, of 30 to 100 tons capacity. The light weight of the complete unit in proportion to its capacity is a characteristic which is highly appreciated by operators. Three models have single pumps and two have high and low speed pumps which may be operated separately, alternately or together. Alloy steel rods are recommended as the Simplex Jenny will stretch, collapse or pull apart any mild steel rod that will fit through the center hole. The unit is built of heat-treated alloy steels to withstand heavy loads and service abuse. Each Jenny is tested before shipment for 50% overload.

Bulletin No. 43J on the Simplex Jenny Hydraulic Puller, which has just been published by Templeton, Kenly & Co., Chicago, Ill., will be mailed on request.

General Electric Announces New Magnetic Comparator

A new magnetic comparator for controlling the quality of ferrous parts of the same size and shape, has been announced by the Special Products Division of the General Electric Co. When the part to be tested is placed in a coil which has been balanced electrically against a standard part, the new comparator detects any difference in the two parts which changes the magnetic flux linking the coils surrounding them. Differences may be caused by wrong composition, improper heat treatment, hardness, size, or other properties which affect the magnetic flux within the coil. The difference is shown as unbalance on the comparator's indicating instrument which reads within passing limits when the tested part is acceptable.



The comparator is sufficiently sensitive to distinguish between steels whose hardness varies as little as two points Rockwell when hardness difference is the sole variable. It is particularly designed for the fabricator of iron or steel parts who desires a nondestructive test to make certain that each part has the required properties within the limits of a standard part.

Continued on page 30

STURTEVANT QUALITY

SPRING TESTER

Fast, Accurate and Inexpensive

$12.75

Torque wrench not included

Immediate Delivery

Using any accurate torque wrench and its measuring element, this inexpensive spring tester measures the recoil of springs up to 7" (free length) and 2½" in diameter when compressed to any predetermined length. As easy to "set" as a vernier scale; as easy to operate as a light arbor press; and as easy to read as a school ruler—no multiple dials, no relative readings, no complicated computations. Just pull down the torque wrench handle, and take the direct reading when the built-in tone device sounds. Enables anyone to inspect, test, check or measure the recoil of springs in a few seconds . . . to accurately match sets of springs (as valve spring of engines) in a few minutes.

Widely used for testing springs in laboratories and in heat treating, inspection, assembly and repair departments to eliminate costly guesswork in building and maintaining automotive and aircraft motors. (Note: Torque Wrench NOT INCLUDED, unless specified.)

Write for Bulletin ST-17

P. A. STURTEVANT COMPANY
ADDISON, ILLINOIS

P A STURTEVANT CO.
ADDISON QUALITY ILLINOIS

The comparator consists of a variable-voltage transformer, a sensitivity control rheostat, coarse and fine balance control rheostats, and the required capacitors—all mounted in a portable, steel case. The zero-center indicating instrument, control knobs, and the necessary switches are conveniently located on the front of the panel.

The test fixtures furnished with the magnetic comparator are two air-core coils; but where surface conditions permit and the parts are too large for suitable coils, two gage heads can be furnished for contact measurements. These fixtures are interchangeable and both are equipped with flexible leads and connectors. Coils are available in a variety of sizes and give breadth to the scope of the comparator's operation, since it attains its greatest degree of sensitivity in testing when the inside diameter of the coil closely approximates that of the part being tested.

To operate the instrument, two parts of the same size and shape selected from a group of acceptable parts are placed within the coils where they are held in the same relative positions by wooden jigs especially designed by the user to fit them. Next, by adjusting the sensitivity control and the coarse and the fine balance controls, the comparator's circuit is balanced to give a zero reading on the indicating instrument. One of the acceptable parts is then replaced by the part to be tested. Instantly, the direct current provided by the full-wave rectification, which is essentially the difference in current between the coils, indicates on the instrument a variation between the magnetic flux of the acceptable part and that of the part being tested.

"Magic-Grip" Sheave

A new sheave, designed for quick and easy mounting and demounting, has just been announced by the Allis-Chalmers Manufacturing Co., Milwaukee, Wisconsin.

Known as the "Magic-Grip" Sheave, it locks to shaft in one tightening operation. As its tapered split bushing, which accommodates normal shaft tolerances, is drawn further into sheave, sheave, bushing and shaft are locked together simultaneously. This positive clamp fit makes sure that the "Magic-Grip" Sheave is perfectly centered and secure . . . assuring smooth running performance free from back-lash and shear.

The company states that the new design of the "Magic-Grip" permits sheave to be mounted closer to motor . . . increasing bearing life by reducing shaft overhang. They will be stocked in a complete line at no increase in price.

To Put On:

When sheave is placed on shaft, it slides on smoothly and easily because increased tolerance is provided by its tapered split bushing. No hammering or forcing is necessary. And the complete unit of sheave and bushing comes intact . . . ready for instant mounting. You merely slide it to exact position where it lines up with the sheave it is to drive or be driven by. True alignment requires little time and effort . . . results in smooth running performance. Tighten three cap screws and "Magic-Grip" is ready to go. Tapered bushing, sheave and shaft lock together securely in one operation. Gripping action is uniform and firm . . . eliminating back-lash and shear. And there are no set screws to damage shaft.

To Take Off:

Remove three cap screws. This frees bushing collar from sheave—but does not release clamping action on shaft. Two of the cap screws are therefore used as jack screws. They are inserted into tapped holes

FRASER-BRACE ENGINEERING CO., Inc.

Design, construction and installation of complete plants and projects

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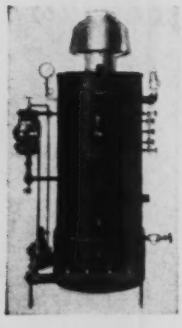
now a necessary economy!



Forced to conserve precious fuel stocks, many plants and buildings will shut down their large central steam boilers this summer. To provide needed summer process steam at constant pressure, there's nothing more practical, more dependable, more efficient than a —

KANE GAS-FIRED STEAM BOILER

This boiler takes very little room and can be placed right next to the process equipment it serves. Patented double-diaphragm valve throttles gas input in exact proportion to steam demands and maintains desired operating pressure. Sizes 1 to 30 H.P. Built to A.S.M.E. standards for 100 pounds pressure. Higher pressures to order.

KEARNS-KANE-OFFELDT

Manufacturers of Automatic Steam Boilers for over a third of a century

1903-1915 EAST HAGERT STREET, PHILADELPHIA 25, PA

IMO Serves STEAM OR DIESEL

This De Laval-IMO fuel-oil transfer pump is installed on a Diesel-driven C-2 cargo vessel. On steamships De Laval-IMO pumps supply oil at high pressure to burners. De Laval-IMO pumps circulate "lube" oil on both motorships and steamships. IMO pumps handle any quantity of any oil against any pressure. They have only three moving parts, no valves, no gears and no cams, are free from vibration and pulsation and can be coupled directly to standard speed motors or turbines.

Ask for Publication I-110

IMO PUMP DIVISION

of the De Laval Steam Turbine Company

Trenton, New Jersey

• Keep Informed

in the bushing collar. When the two jack screws are turned, bushing is separated from sheave. As the bushing is released, it regains natural expansion—automatically breaking tight grip of bushing on shaft. Entire unit is then free for quick, easy removal. No hammering or other forcing is necessary.

More complete information concerning "Magic-Grip" Sheaves may be obtained by writing for Bulletin B6310, Allis-Chalmers, Milwaukee 1, Wisconsin.

Brown Instrument Co. Wins Renewal of Army-Navy "E"

The Navy Board for Production Awards has notified The Brown Instrument Co., Philadelphia manufacturer of industrial instruments, and a division of Minneapolis-Honeywell Regulator Co., that the company has been granted a renewal of its Army-Navy "E" Award for an additional period of six months. In making the Board's decision known, Admiral C. C. Bloch, its chairman, also advised E. B. Evleth, vice president, that the Brown company would receive a new pennant with one star affixed.

"The men and women of The Brown Instrument Co." said Admiral Bloch, "have achieved a signal honor by continuing their splendid production in such volume as to justify this renewal of the Award. In the first place it was difficult to win the Army-Navy 'E' and by meriting a renewal, the management and employees have indicated their splendid determination and ability to support our fighting forces by supplying the equipment which is necessary for ultimate victory."

The Army-Navy "E" was first awarded to The Brown Instrument Co. July 5, 1943. Ceremonies in which the "E" Pennant was formally presented to the Company were held last July 27. The company before, at that time, and since, has been producing many instruments for American and Allied military use in this war.

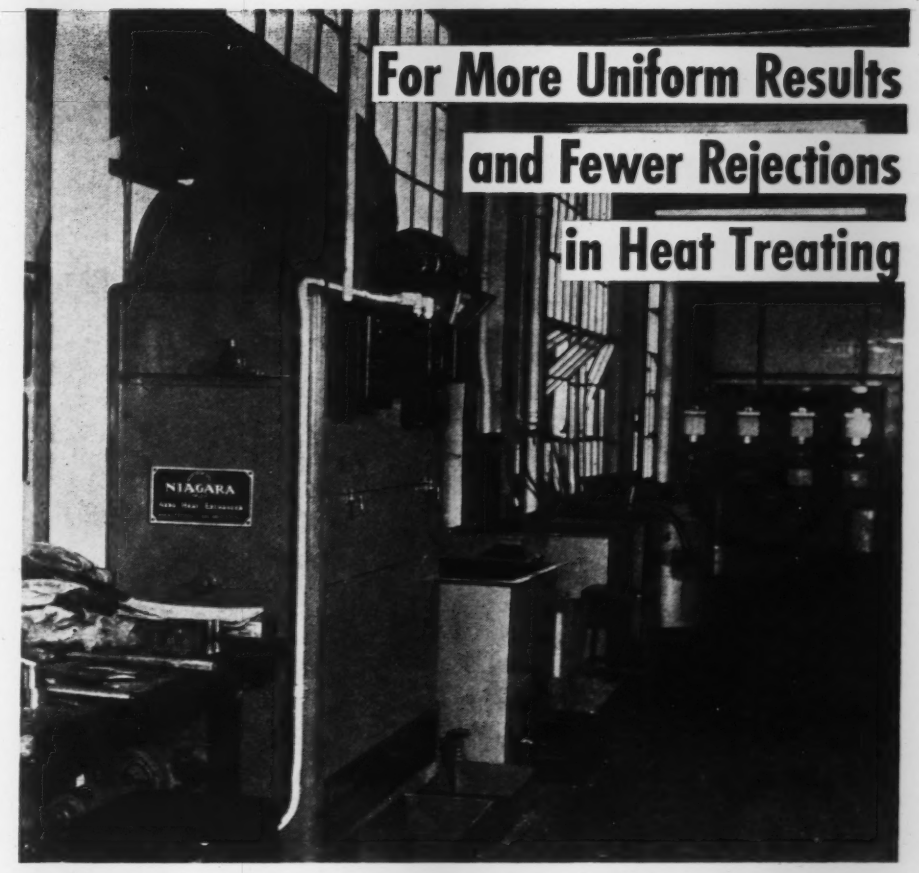
Type P Combustion Control Equipment

A new system of combustion control, said to make available to the smaller industrial and municipal power plant a regulation as effective and reliable as Leeds & Northrup's Metermax System brings to the large central station, has recently been developed by that company.

Applicable to boilers fired with coal, oil or gas, this system, known as Type P, continuously proportions fuel and air to steam demand, and at the same time, controls furnace pressure. To regulate fuel-feed and draft (either forced or induced), the system provides a simple electrical balance (using the Wheatstone Bridge principle) by which the settings of valves, dampers or vanes are varied in definite proportion to steam demand as directed by a Master Controller. The remaining draft damper or other device is simultaneously regulated by the Furnace Pressure Controller.

If for any reason the operator does not desire full automatic control, he can move any of the drive units from push button

Continued on page 33



For More Uniform Results and Fewer Rejections in Heat Treating

● Two years of experience with the NIAGARA *AERO* HEAT EXCHANGER as used to cool water and oil quenching baths for heat treating has proven that more accurate control of temperature pays extra dividends.

First installed by many users because it saved nearly all the cost of cooling water and the attendant piping and pumping costs, it has proved to these same users that its greatest value is in improving and increasing production by assuring more uniform, reliable operations, with more accurate hardening results and greatly decreased rejections because of more accurate control of temperatures.

If you have a problem of cooling any industrial liquid to controlled temperatures—as in quenching, machining, grinding or wire drawing coolants, or in chemicals or intermediates, or in equipment or engine jacket water, or in air compressor cooling to keep water and oil out of the lines, the NIAGARA *AERO* HEAT EXCHANGER provides accurate temperature control at lower cost.

Write for complete information

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Field Engineering Offices in Principal Cities

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INDUSTRIAL COOLING • HEATING • DRYING
HUMIDIFYING • AIR ENGINEERING EQUIPMENT

BIG Sizes for BIG Jobs

The Model "U" shown above is 12" in diameter and rated at 1000 watts. The Model "L" is 4" in diameter and rated at 150 watts. Other models in this series of larger units are 10", 8", 6" and 5" in diameter and rated at 750, 500, 300 and 225 watts respectively. These rheostats handle tough applications with ease. They provide permanently smooth, close, trouble-free control on big jobs. Made in single or tandem assemblies, in straight or tapered winding, from 25 watts to 1000 watts.

Your "Answer Book" to Resistance Problems

Write on company letterhead for 96-page Industrial Catalog and Engineering Manual No. 40.

OHMITE MANUFACTURING CO., 4809 Flournoy St., Chicago 44, Ill.

BE RIGHT WITH OHMITE
RHEOSTATS • RESISTORS • TAP SWITCHES

stations. Without leaving the panel, he can switch from (1) full automatic control to (2) base load control, and regulate air supply from a single push button, with fuel supply automatically following in the proper relationship and with furnace pressure automatic. He can, as easily, (3) regulate both air and fuel from push buttons, with furnace pressure automatic. Or (4) he can switch to complete push button control and regulate each drive unit separately from the panel.

This independent operation of drive units allows the controllers to be serviced without interrupting boiler operation. Except for drive units, all equipment can be shipped on an easy-to-install panel. Or if preferred, equipment can be mounted on a complete boiler panel—along with draft gauges and other instruments. Drive units are connected to panel by simple conduits which any plant electrician can install.

To learn more about Type P Combustion Control, write Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.

New Plating Is Superior to Nickel in Many Ways

Certain copper or brass parts of aircraft instruments that carry high-frequency currents must be corrosion resistant. Electrically, they must have high surface conductivity because of high-frequency current skin effect. Nickel, normally used to provide anti-corrosion protection, has high electrical resistance. In seeking a solution to this problem, Westinghouse engineers turned to gold, which is non-corrosive, satisfactorily conducting, but costly.

Electrochemists finally evolved an answer that disposed of this particular worry and provided a plating technique valuable in many applications unrelated to the original need. Special plating anodes are made of an alloy of copper, tin, and zinc. With these soluble anodes, copper and brass parts are plated using standard plating practices.

The results are truly amazing, according to Westinghouse engineers. The plated surface has the necessary electrical conductivity for high-frequency applications and is far superior to nickel in corrosion resistance. Further, the finish is mirror-like, being surpassed in this respect only by silver itself. As to abrasion, the surface is roughly twice as good as the usual nickel coating. The new plating is entirely non-magnetic (not true for nickel) and is easily soldered, a fact of great value in many electrical applications. Furthermore, the new plating process has great "throwing power." In other words, deep interior surfaces (in objects with cavities) are plated much more uniformly than is possible with nickel.

Air Heated While Cooled Protects Detection Towers

Air conditioning which heats while it cools now protects sensitive ratio detection towers in American battle areas and may point the way to a new type of controlled indoor weather in peacetime, refrigeration engineers of the York Corp. laboratories at York, Pa., disclosed.

The system, which blends both heat and cold together, makes practical a constant and accurately balanced ratio of temperature and humidity. Used by both the Army and Navy, the small self-contained unit has solved the problem of high tropical humidity in towers housing electronic equipment and in optical huts where emergency repairs are made on sights and military lenses.

By actually reheating the air slightly after it has been chilled sufficiently to remove all

Continued on page 34

Castolin Eutectic*

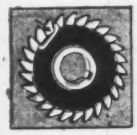
EUTECTIC*

(Means Lowest Binding Alloy)

LOW TEMPERATURE WELDING

WHY EUTECTIC IS THE FASTEST GROWING WELDING ROD (for oxy-acetylene, metallic arc, etc.) IN AMERICA

The acceptance gained by Eutectic Low Temperature Welding Alloys in two short years is unmatched in the Industry. The reason—Eutectic Low Temperature Welding (for salvage, maintenance and production) offers advantages never before combined in any welding process.



HIGH STRENGTH

Eutectic joints equal or surpass parent metal in tensile strength . . . 2 to 3 times stronger than brazing or soldering.

PERFECT MACHINABILITY

Eutectic Alloys bind at safe, lower temperatures, thus eliminating stresses, distortion, brittleness.

MATCHING COLOR

With Eutectic you can have undetectable, color matching welds . . . another advantage over brazing. (Important for salvage)

ALL-AROUND ECONOMY

Thin flowing Eutectic Alloys give stronger joints without fillets . . . Lower temperatures are reached faster and preheating is reduced. Smooth joints eliminate after-machining.

INVESTIGATE EUTECTIC TODAY

Do you weld cast iron, steel, alloy steel, aluminum, brass, bronze, copper, nickel, nickel alloys, Dow-metal? . . . One of 43 Eutectic rods will do a better job and effect considerable economies in your plant.

*Eutectic & Low Temperature Are Reg. U. S. Pat. Off.

EUTECTIC WELDING ALLOYS COMPANY

Originators of the Low Temperature Welding Process

40 Worth Street • New York 13, N. Y.

EUTECTIC WELDING ALLOYS CO., 40 Worth St., N. Y. 13, N. Y.
Dept. Z-3

Please send me:

☐ 8 p. Booklet on Eutectic Tool Salvage Instruction Poster

☐ 36 p. Eutectic Data Book

☐ Instructive House Organ

Name.....

Company..... City.....

Address.....

unwanted moisture, the equipment is able to maintain a constant humidity of 50 per cent in the conditioned space although the surrounding climate may frequently reach the moisture saturation point. It prevents temperature from falling too low by putting back automatically into the conditioned space some of the heat units which it has taken from the air. This heat is usually discarded as waste in the conventional system.

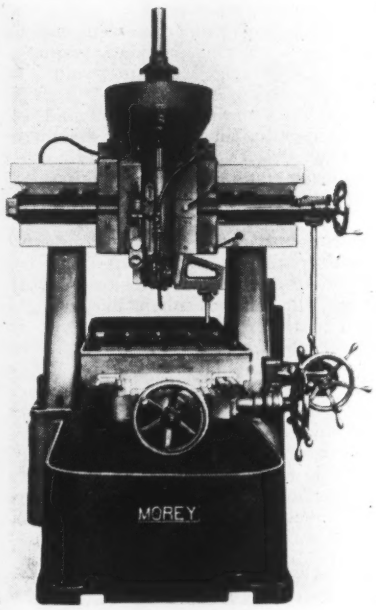
Air conditioning and humidity control is vital to many new types of high frequency radio equipment, not only to protect the sensitive apparatus itself but to safeguard the men who operate it as well, according to B. E. James, head of York's equipment development laboratory. The problem is complicated by the fact that in tropical regions engineers must contend with the intense heat created by their own equipment as well as with the weather outside.

Even in temperate zones it is frequently impossible for ordinary air conditioning to provide complete comfort when humidity rises excessively and under such conditions occupants are apt to experience either a feeling of clamminess or unusual chill. For example, on a day when the mercury is only 70 but the humidity stands at 90 or over, excessive moisture can be removed from the air only by lowering the temperature to such a degree that it becomes uncomfortably cool.

Mr. James explained that the condenser reheat unit solves this problem by interrupting the normal cycle of a conventional air conditioning system. It taps off some of the hot refrigerant gases after they have left the compressor and are on their way to discharge their load of heat units through a condenser. Instead of flowing directly to the condenser, the hot gases are passed through another coil which heats the air as it leaves the cooling mechanism. Automatic controls regulate the whole operation, turning on and shutting off the reheating coil to maintain an absolutely fixed ratio of temperature and humidity in the conditioned space.

Morey No. 30M High Speed Vertical Profiler and Milling Machine

Morey Machinery Co., 410 Broome St., New York, N. Y., announce their new Morey No. 30M High Speed Vertical Profiler and Milling Machine, built for the economical duplication of parts within its capacity requiring accurate interchangeability. The machine can be furnished with: (a) Hand feed to the table, cross slide and spindle (standard). (b) Hand feeds and a power driven feed to either table, cross slide, or spindle; or a combination of any of the 2 or 3. (c) Hydraulically actuated (cylinders) to either table, cross slide, or spindle; or all 3 (no hand feeds).



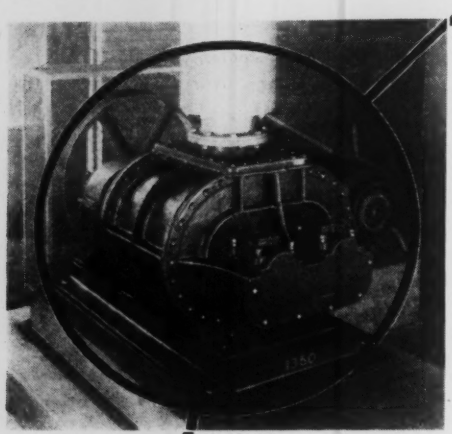
These machines follow the same general design successfully embodied in our No. 12M Vertical Profiler and Milling Machine, namely: (a) Chatter marks in the work reduced to a minimum. (b) A heavy substantially well ribbed base carrying the columns and cross rail rigidly bolted to the base making a rigid box section. (c) Cross head mounted in balance sliding on a hardened steel strip. (d) Provision for increased or decreased daylight space between spindle and table. (e) Spindle mounted in high speed preloaded super-precision ball bearings. (f) Motor hung on the cam providing ease and quick adjustment for the V-belt. (g) Spindle and driving pulley splined. (h) Back gears easily engaged and disengaged.

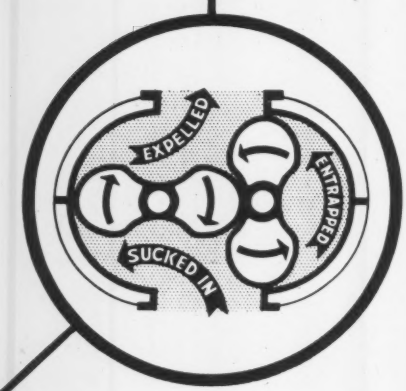
80, 115, 170, 250, 360, 550, 820, 1200 and 1800 RPM Spindle speeds are given for

Air
THE *Economical* WAY TO MOVE MANY MATERIALS

Pneumatic conveying (under pressure or suction) of bulk or granular materials is finding ever-increasing favor as a definite means of saving time and moving material economically. Naturally, such applications often place very severe operating conditions on the air moving equipment—that's why Engineers, desiring performance-proved units with a record of trouble-free service and long life expectancy, specify Roots-Connersville Positive Displacement Blowers or Vacuum Pumps.

Photo shows "R-C" Vacuum Pump moving ashes from sludge incinerators—under severe service conditions. Capacity of this unit is 1700 c.f.m., at 478 r.p.m., producing 7-½" Hg. vacuum.





POSITIVE DISPLACEMENT
The Principle is simple and effective

Twin impellers alternately suck in, momentarily entrap, and then expel definitely measured amounts of air, resulting in the delivery of four equal pre-determined volumes each revolution of the drive shaft. Impellers need no seal or lubrication. Capacity varies with speed. Pressure or suction automatically builds up to overcome resistance to flow.

ROOTS-CONNERSVILLE BLOWER CORP.
403 Michigan Ave., Connersville, Ind.

BUY WAR BONDS . . GIVE BLOOD!

Roots CONNERSVILLE SINCE 1854
Rotary Positive BLOWERS and VACUUM PUMPS
FOR PNEUMATIC CONVEYING SYSTEMS

1800 RPM motor and standard V-belt drive; with motors of other RPM spindle speeds in proportion.

All shafts in the control movement mounted on anti-friction bearings.

All slides are scraped to the ways and equipped with long taper gibs, providing adjustment against future wear.

The hand wheels are geared (planetary 1 to 4 reduction) to the driving shaft, substantially reducing the force required which makes it possible to use female operators.

Ample lubrication is provided for all bearings and oil grooves for all sliding surfaces. Bijur one-shot lubrication system is provided as standard equipment.

Daylight distance can be increased or decreased (maximum height 24") by the removable filler block under the table. The height of the cross rail and operating levers remain constant.

The cross rail of substantial proportions, designed so that the slide castings carrying the spindles and the motors are in balance, practically eliminating vibration.

The motor is rigidly held in an eccentric mounting and clamped by one set screw, providing a simple and quick adjustment for increasing and decreasing the center distance between motor and spindle, thus maintaining constant belt tension.

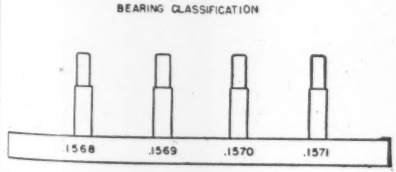
The spindle is an alloy steel forging, hollow bored, designed so that a drawbar operated from the top of the machine may be used for holding the cutters in position. The spindle stop consists of a hand index roll with four adjustable screws actuating a built-in indicator graduated in .001". The operator may set the spindle stops at four different points within the total vertical 8" range of the spindle, and stop at predetermined depths.

A tank for cutting lubrication is an integral part of the base of all machines.

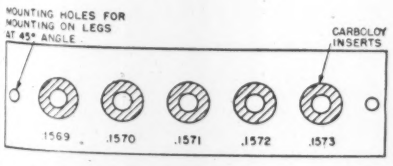
The machines are arranged to receive a motor driven coolant pump made in two styles, centrifugal and geared (at extra cost). A centrifugal pump is recommended for low pressure and high volume.

Bearing Classification System for Small Motors

Small precision-type motors are assembled with bearings previously selected to match the diameters of the fits as the result of a method developed by R. R. Cameron, foreman at one of General Electric's plants. The method has given most accurate and satisfactory results.



PIN GAGES



CARBOLOY RING GAGES

New ball bearings as received are checked on a series of pin gages to classify them according to inside diameter. Each gage is 0.0001 inch different in size. These sizes are

Continued on page 36

Where PRECISION is All-important . . .

Too much depends on the reading-clarity of a blueprint to let a better tracing-quality pencil pass without investigation! **HI-DENSITY** line from a modern *Hi-Density Microtomic Van Dyke* pencil will hold crisp, sharp clarity in your finest details. Even on a high speed blueprint machine, or other quantity reproduction processes. 18 degrees from 9H to 7B, and 6 degrees (4B–2B–HB–2H–4H–6H) with rectangular "chisel point" leads.

HI-DENSITY

MICROTOMIC VAN DYKE

DRAWING PENCILS

IF YOU WISH THIS 20" SLIDE RULE created by Eberhard Faber as a war-time service to engineers and draftsmen sign below and mail with **25¢**

EBERHARD FABER PENCIL CO.,
Dept. ME-3
37 Greenpoint Ave., Brooklyn 22, N. Y

For enclosed 25¢ please send VAN DYKE 20" SLIDE RULE—war-time card printed edition.

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Street & No. _____

City & State _____

arranged to spread over the tolerance of the size of the bearing fit on the rotor shafts. About four gages or pins are necessary and after each bearing is tried on a pin, it is placed in a tray marked with the size of the pin on which it was a snug fit. If a loose fit or a press fit is desired, the bearing is simply placed in the tray identified the same as the pin on which it was a loose or press fit. These bearings are checked on a comparator dial gage for outside diameter and placed in rows in the trays according to 0.0001 inch variation.

A comparator plug gage is used to determine the size of the bearing seat in the end shields and a suitable bearing is pressed into place. Not only is this bearing chosen from the correct row in the tray to fit the end shield, but the particular tray identification is noted.

Bearing fits on the shafts of rotor cores are likewise selected to match the bearings. Each fit is checked with a series of Carboloy ring gages 0.0001 inch different in size. Depending on the fit desired, the proper shaft is chosen to fit the bearing.

With the bearings classified both according to outside and inside diameter, the proper size for both the shaft and end shield at hand can be chosen easily, and the unit assembled has the desired accuracy. This system is very flexible as any type or combination of types of fits can be obtained.

Vapocarb-Hump Method for Heat Treatment of Steel

Anyone who has a problem involving the heat-treatment of tools, dies or small production parts, and doesn't have recent literature on the well-known Vapocarb-Hump furnace equipment, may be interested in a 36-page catalog—"Vapocarb-Hump Method for Heat-Treatment of Steel"—just issued by Leeds & Northrup Co. Although the text of this revised catalog is essentially the same as the preceding 1940 edition, there are numerous new illustrations of recent installations.

Now that America's war-time production has hit its stride, with every tool die and production part called upon to stay on the job for the maximum length of time, there is a peculiarly timely interest in the triple-control method of hardening described in this publication. The three controls embodied in Vapocarb-Hump furnace equipment—Vapocarb control of atmosphere, automatic control of rate-of-heating and hump control of quench point—are said to provide three important advantages: (1) little or no refinishing; (2) negligible rejections; (3) long average tool life. With every phase of the hardening process precisely controlled, and with the tool's heating history recorded visually upon a moving chart, the bare steel—carbon or alloy—is said to leave the furnace with surface free of pits, scale or decarburization; the heat-treater is able to "ease" work through the critical without the danger of "pushing" and to quench at the exact predetermined point above the hump. Thus, it is claimed, the steel is guarded from abnormal stress and hardening losses due to warpage and breakage are reduced to a minimum.

For Catalog T-621—"Vapocarb-Hump Method for Heat-Treatment of Steel"—write to Leeds & Northrup Co., 4934 Stenton Avenue, Philadelphia 44, Pa.

The 70,000th Locomotive Built by Baldwin

The 70,000th locomotive built by The Baldwin Locomotive Works is shown just before being turned over to the United States Army. This "iron doughboy," without frills or trimming, is of the same type as many now being used in military operations abroad. During the 112 years since Matthias Baldwin built "Old Ironsides" (No. 1), the company has averaged one completed locomotive every 14 hours. Inspecting the locomotive at the Philadelphia plant are (left to right) Ralph Kelly, Baldwin president; W. H. Holcomb, operations assistant to the president, and W. G. Stetson, general foreman of the erecting shop.

Electric Molecule Sorter Promotes Speed and Accuracy in Industrial Analysis

Modern refineries and chemical plants require accurate control of all materials and processes. Many products are made continuously—thus if an error creeps in, thousands of gallons or hundreds of tons of material will be spoiled if correction is not made speedily. If the product happens to be high-octane aviation gasoline or synthetic-rubber constituents, the error becomes almost a national calamity.

Production of high-octane gasoline, butadiene, or styrene involve precise critical processes. Laboratory-accurate on a huge scale, they need controls that are both exact and rapid. Westinghouse Research Labora-

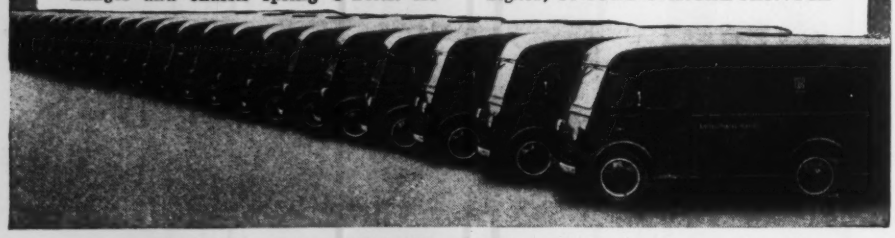
SIX MONTHS' TEST PROVES
Boots Nuts Eliminate Periodic Tightening

"The sample Boots Nuts which you supplied have now been in use on several of our vehicles, both light and heavy, for a period of six months.

We selected two difficult spots for their application, drive shaft universal joint flanges and chassis spring U-bolts. At these points plain nuts are not satisfactory unless a lock washer or jamb nut is used to hold them. Even so, they require periodic tightening.

The Boots Nuts in use have not required any attention since they were installed."

Signed, UNITED PARCEL SERVICE



A portion of the 2900-truck fleet of United Parcel Service trucks serving 16 metropolitan cities

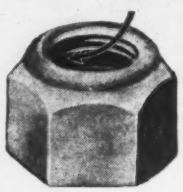
THIS report of a test made by the country's outstanding consolidated delivery company, operating in sixteen cities, is a clear-cut indication of the economies that Boots All-Metal, Self-Locking Nuts will effect in the transportation field after victory.

One piece, all-metal, Boots withstand the corrosive action of oil, water and chemicals. There's nothing to dry out, crack or shrink. Also, Boots Self-Locking Nuts can be used over and over without accelerated locking loss.

BOOTS SELF-LOCKING NUTS "There's No Excuse for a Nut Shaking Loose"

Boots Aircraft Nut Corp. • General Offices, New Canaan, Conn.

The ALL-METAL lock is built in here



ROL-TOP. This style nut, now used on all types of aircraft engines, is the type of Boots All-Metal, Self-Locking Nut mentioned in the above letter.

• Keep Informed

tory has developed a new control mechanism that fulfills the requirements. Previously, chemical tests in an oil refinery have been laborious and have required hours to complete. The new device thoroughly checks operation in a matter of minutes—and requires only one or two technicians.

The mass spectrometer has long been used in laboratories, particularly for exploring the field of nuclear physics. It determines both qualitatively and quantitatively the constituents of a gas. With substances that are alike chemically and differ only slightly in weight, chemical analyses are extremely difficult. The mass spectrometer uses only a small quantity of the gas—it need be only a thimblefull—and ionizes it by impact of electrons from a hot filament in an evacuated tube. The stream of charged molecules is drawn along the tube into a strong magnetic field, where it is bent into an arc-shaped path. The heavier the ion, the larger the radius of curvature of its path. As a result, different molecules emerge from the field at various locations—but all of the same kind leave at one particular spot. Different charged molecules are collected successively at an exit slit into a current that can be amplified and measured. In this way, constituents of any gas can be determined as to kind and proportion.

Built for use in refineries, chemical plants and similar locations, the mass spectrometer is a self-contained tool. No power supply other than 110 volts, 60 cycles is required. The instrument is extremely sensitive and can measure ion beams as small as one billionth of one microampere. (Average antenna current for the home radio is at least one microampere.) In other words, the mass spectrometer counts as few as 6000 ions per second, which isn't many considering that about three billion billion electrons surge in and out of a 60-watt lamp each second. The device can readily detect, for example, the presence of one part of oxygen in 10,000 parts of nitrogen.

The mass spectrometer is expected to have many industrial uses. It may serve to check gases in protective-atmosphere furnaces, it may check completeness of evacuation processes, or it may detect presence of some undesirable constituent in process gas.

Second Gold Star Award for Cooper-Bessemer Recognizes Record Output at Both Plants

Mount Vernon, Ohio—Information released here by The Cooper-Bessemer Corp., covering output of engine horsepower by its plants in Mount Vernon and in Grove City, Pa., shows that outstanding monthly production records made throughout 1943 were maintained during the closing months of the year.

While specific production figures may not be revealed, the company's Mount Vernon plant reached an all-time high in engine horsepower shipped during November. Likewise, production at the company's Grove City plant has been correspondingly high.

The Company's Diesel engines, generating sets, engine-driven compressor units, and foundry products are playing an increasingly important part in meeting the power needs and other requirements of the Allied war machine.

Appreciation of the company's achievements during the past six months was exemplified in a letter received by Gordon Lefebvre, Cooper-Bessemer president and general manager, from Rear Admiral Howard L. Vickery, Vice-Chairman, U. S. Maritime Commission, which said in part, "In recog-

Continued on page 38

In the Production of Magnesium, Both Amsco Alloy and Amsco Manganese Steel Have Found a Place

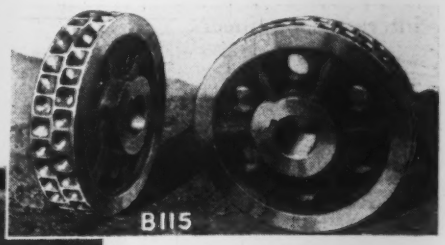
Multiplying by many times America's output of magnesium to meet such needs as lightweight aircraft parts and incendiary bombs has been one of industry's major accomplishments.

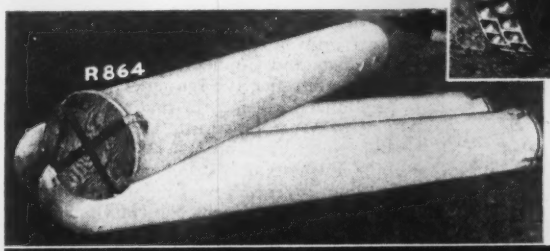
In the Pidgeon process of magnesium production, both Amsco Alloy and Amsco Manganese Steel are used in applications where their respective properties help make continuous operation possible. This process consists of distilling metallic magnesium in the form of vapor from briquettes made of a mixture of ferro-silicon and dolomite under low pressure in a furnace, operating at a temperature of about 2150° F.

There are usually twenty retorts to each furnace, laid side by side. After gases (principally hydrogen) have passed off, the retort is sealed and a vacuum, as nearly perfect as possible, is produced. The retort castings must, therefore, be leakproof. The vapor is condensed by a water jacketed condenser sleeve inserted prior to sealing in the open end of the retort, crystals forming in a dense mass in the sleeve. These crystals, averaging about 15 lbs. per retort at the end of an 8-hour run, are melted and cast into pigs.

Picture R-864 shows some of the Amsco Alloy retorts employed, and in picture K-26 appears one of the many carloads of these retorts which have been shipped during the past two years to producers of magnesium by the Pidgeon process.

Amsco manganese steel also has a part in the same process, in the form of the pressure rolls shown in picture B-115, used for forming the briquettes of powdered ferro-silicon and dolomite. Here the high resistance of manganese steel to pressure loads and abrasive wear affords maximum service life.





Bulletin 108 describes the uses of Amsco Alloy in all industry; and 1041A deals specifically with heat-treating containers.

Send for Bulletin 941W on Amsco Conservation Welding Rods.

Amsco

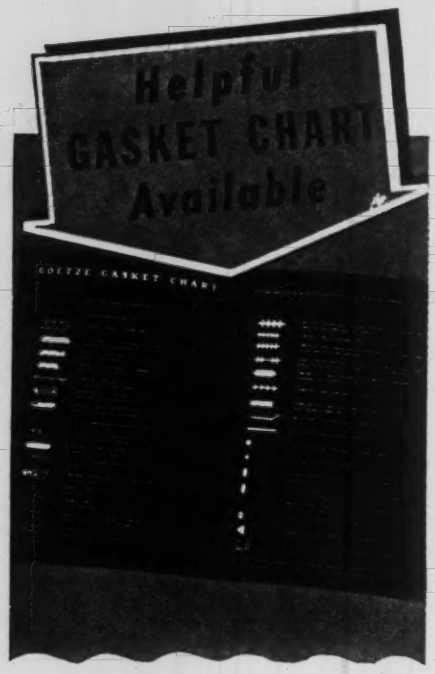
AMERICAN MANGANESE STEEL DIVISION

Chicago Heights, Illinois

FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.

OFFICES IN PRINCIPAL CITIES

AMERICAN Brake Shoe COMPANY



An up-to-the-minute Gasket Chart showing the cross-sections of 36 most popular Gasket Types, their purposes and the characteristics which fit them for the specific services intended, is now available to interested engineers.

This chart has been issued as the third in a series of technical papers on Gaskets compiled by the Research Laboratory of the Goetze Gasket and Packing Company, Inc., oldest and largest manufacturers of industrial gaskets in America.

In requesting copies of this and succeeding issues of "The Gasket," write the company on your business letterhead, mentioning your position.

GOETZE GASKET & PACKING CO., Inc.
24 Allen Avenue, New Brunswick, N. J.

Goetze for GASKETS

• Keep Informed . . .

nition of your continued achievement in completing wartime schedules in the manufacture and delivery of merchant ship components, the Maritime Commission Board of Production Awards has awarded your company its Second Gold Star to be added to your Maritime "M" Pennant . . ."

In commending the company's workers for maintaining unusual production during the year, Mr. Lefebvre also paid tribute to the corporation's employees now in the armed services.

"It is always gratifying to know," he said, "that the thought uppermost in the minds of the men and women, operating our plants and foundries, is to turn out, at top speed, the engines and equipment needed for final victory.

"I appreciate that most of our fellow workers who are now in military service would like to know how we shall put to use the victory they are winning for us.

"Naturally, the final decisions regarding many of our plans, like those of other industries, depend upon the answers to some mighty important questions concerning problems such as taxes and reconversion to peace-time production. I'm quite confident, however, that given a political and economic environment which is favorable to the expansion of free enterprise, they can be sure that we will be able to give them what they'll need to enjoy the victory, just as we are now giving them what they need to win it."

• BUSINESS CHANGES

Kropp Announces Changes in Sales Territories

Kropp Forge Co., Chicago, Ill., announces that Charles L. Foley has been appointed engineering sales representative for New York and adjacent territories which include the metropolitan area of Manhattan, Staten Island, Long Island, and twenty-five upstate counties, Eastern Pennsylvania embracing thirty-five counties, all of Maryland except Garrett and Alleghany counties, Delaware New Jersey and Connecticut. The appointment became effective January 3, 1944.

Announcement is also made that W. R. Moore of West Hartford, Conn., no longer serves New England as representative of Kropp Forge Co. Connecticut has been taken out of the New England group and assigned to New York, coincident with the naming of Mr. Foley.

Hycar Chemical Assigns Bascom to New England, New York City Territory

Akron, O.—Roger C. Bascom has joined the technical service staff of Hycar Chemical Co. and will serve New England, Eastern New York State and Northern New Jersey, according to an announcement made here today by Frank M. Andrews, General Sales Manager at Hycar. The assignment is effective as of January 1st.

Mr. Bascom, who came to Hycar from Standard Products Co. of Port Clinton, Ohio, where he was chief chemist, will make his headquarters and residence in Milford, Conn. Mr. Bascom is a native of New England and is a graduate of Northeastern University in Boston. Before going to Standard Products, he was associated with Converse Rubber Co. and Rubatex Products, Inc.

As Technical Service Engineer, Mr. Bascom will advise rubber manufacturing companies in the compounding and processing of Hycar synthetic rubber and will also work closely with engineers and designers at industrial concerns, aircraft manufacturing companies, textile manufacturers, shipyards, and others, in the application of synthetic rubber products to their design and production problems.

Hycar Chemical Co. is the largest private producer of butadiene type synthetic rubbers, offering a series of rubbers in both the oil-resistant and oil-soluble grades. The company does not manufacture any finished rubber products but is engaged solely in the production of crude synthetic rubber, which it furnishes to leading rubber companies who compound, process and fabricate the material into a wide variety of finished products.

PROFESSIONAL SERVICE
in ALL BRANCHES of the ENGINEERING FIELD

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Constructors—Contractors
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Surveys, Reports, Design, Construction, Supervision
EDWARD R. FEICHT
Bala-Cynwyd, Pa. (outside Philadelphia)

Chemical and Metallographical Laboratories—Welding . . . Supervision, Inspection and Testing, Qualification of Operators and Procedure.
THE JAMES H. HERRON CO., Cleveland, Ohio

Power Plants • New • Rehabilitation
Steam Generation — Diesel and Steam Power
Z. KOGAN, Consulting Service, — CHICAGO

Weld Testing—Qualification of Operators—Supervision—Inspection—Research.
NATIONAL WELD TESTING BUREAU
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Power Plants, Public Utilities, Industrial Plants
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Architects and Engineers
New Haven, Conn.

RATE **Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.**

• Keep Informed

Established in 1940, Hycar has pioneered the development of special purpose synthetic rubber and synthetic rubber products. While production for the past two years has been devoted entirely to essential war items, the products were firmly established before Pearl Harbor and will again be available for general use following the war.

Enlarged New York and Export Office for H. K. Porter Co., Inc.

The opening of an enlarged New York and export office at 50 Church St., New York, N. Y., made necessary to accommodate rapid expansion of its business, has been announced by H. K. Porter Co., Inc., Pittsburgh, Pa.

The new office will serve as an Eastern center for the Company's entire line of locomotives, process equipment and pumps.

Thomas MacLachlan has been named general manager in charge, and is also directly handling locomotive sales and service for the entire Eastern seaboard. Mr. MacLachlan was formerly New York manager of Vulcan Iron Works of Wilkes Barre, Pa., a position he had held since shortly after the close of World War I, in which he served as a First Lieutenant, Infantry.

R. G. Newell, who managed the New York office of Quimby Pump Co. before its acquisition by Porter, is directing activities of Porter's Quimby Pump Division in New England and the New York district, from the new office. Earl M. Bardo, formerly with Robinson Manufacturing Co., is headquartered in the same office, representing Porter chemical process equipment for the same territory. The Company's export department also has been housed at the 50 Church Street address.

Additional district and regional offices are in process of being established thru-out the country, W. W. Calihan, Porter general sales director, said in making this announcement.

Lincoln Electric Appoints R. H. Davies as Washington, D. C., Representative

Announcement has just been made by The Lincoln Electric Co., world's largest producers of arc welding equipment, of the appointment of R. H. Davies as welding engineering representative in Washington, D. C. He will be located at 410 Hill Building.

Davies has had wide experience in the industrial engineering field. He received his college education at the University of Minnesota after which he was employed by The Lockheed Aircraft Corp. where he worked as production engineer on the Lockheed "Hudson" and the first Lockheed "Lightning" aircraft.

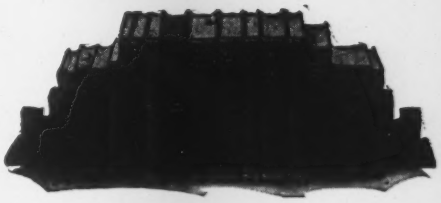
He later became connected with Northrop Aircraft, Inc., starting at their new plant at Hawthorne, California, where he did considerable development work on the Northrop patrol bomber and "Flying Wing." He was given the assignment of developing all production and tooling methods for experimental and prototype aeroplanes and took an active part in the building of several confidential aircraft components of magnesium. Here he collaborated with Mr. V. H. Pavlecka in the development of the Heliarc welding process for magnesium.

Davies next became associated with Henry J. Kaiser where he was first plant engineer in the building of Kaiser's large magnesium plant, the alloy plant, the ferro-silicon plant and the magnesium sand casting foundry at Permanente, California. After the construction period he was made superintendent and was also in charge of production and plant development.

Continued on page 40

RECENT WILEY BOOKS

MECHANICAL ENGINEERING



Post-war plans in your field are being made right now. To become thoroughly familiar with the latest developments in *your* specialty you will need new, authoritative books such as those listed below. Be ready for new demands. Make your selections now and order today by means of the coupon below.

MATERIALS AND PROCESSES
Edited by J. F. Young
628 pages — Price $5.00
Offers a broad background for the design engineer. Tells how to choose the right material for designing, and how to design the product so that it is proportioned with respect to the material to be used and detailed to accommodate the method of processing. *Ready in March.*

PLASTIC WORKING OF METALS AND NON-METALLIC MATERIALS IN PRESSES—Third Edition
By E. V. Crane
540 Pages — $5.00
A handbook of the mass methods of press working modern materials. The book tells how and why plastics move and are moved. For use in planning operations, dies and molds, and in making them function.

WORK METHODS MANUAL
By R. M. Barnes
136 Pages — Price $1.75
A brief book on the fundamentals of good work methods, for shop foremen, supervisors, and workers. Includes a full discussion of process charts, man and machine charts, and operation analysis. *Ready in March.*

CONVEYORS AND RELATED EQUIPMENT
By W. G. Hudson
Approximately 394 Pages — Probable Price $5.00
Discusses those material-handling machines which most frequently enter into the average problems of architects, consultants, plant engineers, and engineering contractors. *Ready in March.*

GRAPHICAL SOLUTIONS—Second Edition
By C. O. Mackey
152 Pages — Probable Price $2.50
Presents the fundamentals necessary in solving problems graphically and mechanically; for instance, shows how to construct alignment charts to solve equations of special form, and how to fit empirical equations to periodic data.

STATISTICAL ADJUSTMENT OF DATA
By W. E. Deming
261 Pages — $3.50
Unifies under one general principle and solution such problems as statistical procedures associated with curve fitting and other adjustments by least squares.

MODERN TURBINES
By L. E. Newman, A. Keller, J. M. Lyons, and L. B. Wales
180 Pages — $2.50
Contains data on modern turbines, obtainable from no other source. Power-plant operators, mechanical and electrical engineers will find invaluable this practical discussion on the selection and characteristics of turbines.

LUBRICATION OF INDUSTRIAL AND MARINE MACHINERY
By William G. Forbes
318 Pages — $3.50
An easily comprehended manual designed to meet the needs of those who face problems on the lubrication of machines and engines of various types. Describes the fundamentals of distillation, cracking and refining, petroleum chemistry and current lubrication practices.

LUBRICANTS AND CUTTING OILS FOR MACHINE TOOLS
By William G. Forbes
90 Pages — $1.50
Offers practical aid to shop superintendents, foremen and tool designers. It discusses the principles of machine tool lubrication from the point of view of practical maintenance. Also covers the composition of present-day cutting oils.

ENGINEERS' DICTIONARY
Spanish–English and English–Spanish
Compiled by Louis A. Robb
423 Pages — Flexible Binding — $6.00
A practical, up-to-the-minute dictionary of engineering and construction terms, expressly prepared for Pan-American use. Uses the Spanish of Central and South America.

FUNDAMENTALS OF VIBRATION STUDY
By R. G. Manley
128 Pages — $2.75
For the engineer and designer, an introduction, logically developed, to basic vibration theory. Does not require a previous knowledge of advanced mathematics.

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• Keep Informed . . .

Lincoln Electric Appoints Brugge Detroit Representative

The Lincoln Electric Co., world's largest manufacturers of arc welding equipment, Cleveland, Ohio, announces the appointment of B. J. Brugge as welding engineer in the Detroit, Michigan, office.

Mr. Brugge, who has been associated with Lincoln since 1931, has served in the Los Angeles, California and Houston, Texas, offices and, until his transfer to Detroit, has been located in Washington, D. C.

He is a graduate of Purdue University and began his career in arc welding with two years in Lincoln Research Laboratories. In 1935 he was granted a leave of absence to assist the application of electric welding in the Near East. Serving in the capacity of welding superintendent for the Anglo-Iranian Oil Co., he spent two years at Iran, Persia, supervising welding operations in the construction of refineries and pipe lines. He directed the training of many Persi ns in the art of welding and increased the Anglo-Iranian Company's welding forces from 30 to 120 arc welders.

Following his work in Persian oil fields, Brugge spent four months in the British Isles as welding consulting engineer for British and Scottish firms.

During the past two years, Mr. Brugge redesigned and constructed the Army's first all welded medium tank at Rock Island Arsenal and helped develop armor plate welding working with the Army Ordnance at the Aberdeen Proving Grounds. He has also assisted the Navy and Maritime Commission with consulting services on shipwelding.

IRVING GRATING PRODUCTS

Simplified SNOW Removal

A curb-to-curb catch basin covered with 80% open steel Irving "DRY-WAY" Covers will take care of a tremendous volume of snow and slush when it is deposited on the "DRYWAY" by plows and trucks and forced through the mesh by passing vehicular traffic.

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LONG ISLAND CITY 1, NEW YORK

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In his new position Mr. Brugge will be engaged in welding engineering work in Detroit where his wide experience in all phases of arc welding will be available to firms in that area for assisting them in the design and fabrication of both present and post-war products.

Farrel-Birmingham Appoints Personnel Director

Farrel-Birmingham Co., Inc., of Ansonia, Conn., announces the appointment of Mr. Albert W. Hendrickson as Director of Employee Services, in charge of employment, first aid, training programs, employee magazine, cafeterias, and other personnel activities, at the company's three plants at Ansonia and Derby, Conn. and Buffalo, N. Y.

Mr. Hendrickson comes to Farrel-Birmingham Co. from Kellett Aircraft Corp. of Philadelphia, where he was Director of Industrial Relations. Prior to that he had been associated with Collins & Aikman Corp. as Production Superintendent and in other capacities. Mr. Hendrickson is a graduate of the University of Pennsylvania, receiving his B.S. degree in 1930 and A.M. degree in 1941. He was formerly a member of the faculty of Wharton School, Industry Department, University of Pennsylvania, teaching industrial relations and industrial research. He also taught classes in engineering, science, production supervision and personnel management, and has conducted courses for the War Manpower Commission in job instruction training for Training Within Industry groups.

B&W Augusta Works Receives Second Army-Navy "E" Renewal

A new pennant, with two stars affixed, has been forwarded by the Navy Board for Production Awards to the Augusta (Georgia) Works of the Refractories Division of The Babcock & Wilcox Co. In a letter addressed to A. G. Pratt, president of B&W, Admiral C. C. Bloch states that the award is for meritorious services on the production front, and calls it a symbol of appreciation from our armed forces for the continued and determined effort and support so necessary for victory.

Cochrane Corporation Receives "E" Award

Cochrane Corp. of Philadelphia, since 1863 manufacturers of power plant equipment, specializing on Water Conditioning Equipment, Filters, Blow-Off Systems, Steam Specialties and Flow Meters, have been given the Army-Navy "E" Award for excellence in production.

Presentation ceremonies took place at the plant Tuesday, February 15th.

Named Assistant to Westinghouse Vice President

H. W. Tenney, formerly Assistant Director of the Westinghouse Research Laboratories, has been named assistant to Thomas I. Phillips, Vice President in charge of the Company's Pittsburgh Division, it was announced recently. In his new position Mr. Tenney will help coordinate vital wartime engineering activities.

Mr. Tenney came to Westinghouse in 1920 as a draftsman in the Switchboard Engineering Department at East Pittsburgh. Two years later, he went with the Materials and Process Engineering Department where he successively held the positions of laboratory foreman, section engineer and division engineer in charge of the high voltage laboratory, engineering laboratory, high power laboratory, chemical and physical laboratory and the central engineering laboratory.

In 1936, Mr. Tenney was named manager of the Central Engineering Laboratory Department, later becoming engineering manager of the New Products Division when it was organized in 1937. A year later he was made manager of the Engineering Laboratories and Standards Department, holding that position until appointed assistant director of the Research Laboratories in 1941.

He is a fellow of the American Institute of Electrical Engineers, president and a director of the Westinghouse Educational Center, a trustee of the Westinghouse Technical Night School, and a member of the University Club of Pittsburgh.

Elastic Stop Nut Announces New Manufacturing Head

William T. Hedlund, president of Elastic Stop Nut Corp. of America, with plants in Union, N. J., and Lincoln, Nebr., announces the appointment of Harry K. Werst as vice president in charge of manufacturing. Mr. Werst, a partner in Booz, Allen and Hamilton, has had extensive experience in manufacturing operations, and will be in complete charge of manufacturing processes in all of ESNA's operations.

Mr. Werst's experience includes several years with the Baldwin Locomotive Works in

COMING MEETINGS AND EXPOSITIONS

During the next three months

MARCH

1–2	American Management Association, Finance Conference, Hotel New Yorker, New York, N. Y.
26–28	American Society of Tool Engineers, Annual Meeting, Bellevue-Stratford, Philadelphia, Pa.
28–30	Greater New York Safety Council, 15th Annual Convention and Exposition of Safety Equipment, Hotel Pennsylvania, New York
28–31	American Management Association, Packaging Conference, Palmer House, Chicago, Ill.

APRIL

2–5	The American Ceramic Society, Inc., Second War Congress and 46th Annual Meeting, Hotel William Penn, Pittsburgh, Pa.
3–5	The American Society of Mechanical Engineers, Spring Meeting, Hotel Tutwiler, Birmingham, Ala.
3–7	American Chemical Society, Cleveland, Ohio
5–7	Society of Automotive Engineers, National Aeronautic Meeting, Hotel New Yorker, New York, N. Y.
13–14	Midwest Power Conference, Palmer House, Chicago, Ill.
20–21	American Institute of Mining and Metallurgical Engineers, Joint Conference, Open Hearth Steel Comm. and Blast Furnace and Raw Materials Comm., William Penn Hotel, Pittsburgh, Pa.
25–28	American Foundrymen's Association, 48th Annual Meeting and Third War Production Foundry Congress, Memorial Auditorium, Buffalo, N. Y.
27	Institute of the Aeronautical Science, Light Plane Meeting, Rackham Memorial, Detroit, Mich.

MAY

17–18	S.A.E. National Diesel-F & L Meeting, Hotel Knickerbocker, Chicago, Ill.

For Calendar of coming A.S.M.E. Meetings see page 224 in the editorial section.

• Keep Informed

Philadelphia. From there he went to the Jeddo-Highland Coal Co., of Hazelton, Pa., as assistant director of research on power plant design and fuel efficiency research. From 1933 to 1940, he was with the Budd Co. of Philadelphia, serving as assistant superintendent, and later as superintendent of the Stainless Steel Fabricating Department, and also as superintendent of the fabricating and construction of stainless steel railway cars.

He joined Booz, Allen and Hamilton, management engineers of Chicago, in 1940 as staff engineer, and in January 1942, was made a partner.

Mr. Werst is a graduate of Pennsylvania State College, with a B.S. degree in mechanical engineering. He is a member of the American Society of Mechanical Engineers. He was born in Philadelphia, and attended the West Philadelphia High School.

Omega to Builders

Mr. H. S. Chafee, Treasurer of Builders Iron Foundry, Providence, R. I., and Mr. L. E. Harper, President of Omega Machine Co. of Kansas City, Mo. announce a consolidation whereby the latter becomes a wholly owned subsidiary of Builders Iron Foundry. Mr. Harper continues as President and Director of Omega and the Company will continue at its present address, 3409 East 18th Street, Kansas City.

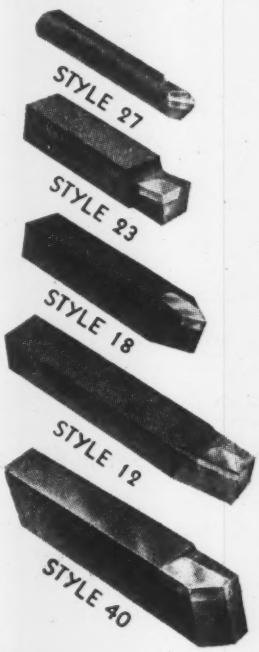
Builders Iron Foundry, one of the real old New England firms, was established in Providence in the year 1820. Since 1889 this Company has acquired a world-wide reputation as manufacturers of "The Venturi Meter." Builders comprehensive line of flow meters, controllers, gauges, etc., is now distributed by Builders-Providence, Inc., a division of the parent company. Builders products for measuring and controlling the flow of liquids and dry materials, recording and controlling liquid level, etc., are extensively used in water and sewage disposal plants and also find a variety of applications in industrial plants.

The Omega Machine Co., established in Kansas City in 1928 by Mr. E. E. Harper, has developed a line of related products including both volumetric and gravimetric dry feeders and continuous lime slakers. Under the leadership of Mr. L. E. Harper, Omega has made noteworthy strides, and today its feeders for the feeding of granular and powdered dry materials such as activated carbon, soda ash, lime, and the like are standard equipment in water and sewage plants and for many industrial applications. During the past few years Omega has handled an expanding volume of orders for war plant facilities, necessitating the purchase of new and larger quarters in 1942. Still larger manufacturing facilities will now be available to their rapidly growing business.

Builders has engaged in the manufacture of special war products during World War II, the fourth major conflict in which the Company has served our armed forces in this manner. Recently, and for the third time during this war, the "men and women of Builders Iron Foundry" have won the Army-Navy "E" for "high achievement in the production of war material."

This merger brings together Builders-Providence, Omega and Builders' associate company % Proportioneers, Inc. %, three fine organizations, each a specialist in its own field. %Proportioneers%, as engineers and manufacturers, produce a complete line of liquid chemical feeders employed in the treatment of water and sewage, as well as proportioning devices for industrial process blending and treating. Mr. R. P. Lowe,

Continued on page 42



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SUPERIOR CEMENTED CARBIDES

President of %Proportioneers% joins Messrs. Chafee and Harper in the anticipation that this merger will be mutually beneficial particularly in helping them to serve more effectively the several industries for which their products are designed.

Packard Appointed Chicago District Manager by Baldwin Locomotive Works

Appointment of D. I. Packard as Chicago district manager of The Baldwin Locomotive Works is announced by Ralph Kelly, president of the company. Mr. Packard succeeds Charles Riddell, who has been Chicago district manager since 1905, and who has a record of 61 years of continuous service with Baldwin. Mr. Riddell will continue his association with the Chicago office as special representative.

Mr. Packard was born in Granville Township, Bradford County, Pa., November 26, 1894. He entered the employ of the New York Central Railroad in the locomotive shops at Avis, Pa., in May, 1911 and, except for one year in the United States Navy during World War I, served in various capacities in the mechanical department of that railroad until December 31, 1923.

Mr. Packard became associated with the Franklin Railway Supply Co. in January, 1924, and served as resident supervisor of manufacturing operations and as plant manager at Baltimore, Md., until September 1, 1936, when he was transferred to the sales department.

While serving as assistant Western sales manager, the War Production Board requested Mr. Packard's services to assist in arranging for the production of components required for the locomotive construction program. This assignment in Washington began in November, 1942, and was terminated December 15, 1943 so that Mr. Packard could take up his new duties with Baldwin.

New Kropp Representative in Southern California

H. M. Comstock, for more than fifteen years director of sales for the Simplex Products Corp., Cleveland, Ohio, has been made engineering sales representative of Kropp Forge Co. and Kropp Forge Aviation Co. for the Southern California territory, announces Roy A. Kropp, president.

Mr. Comstock served a year with the Tools Division of the War Production Board in Washington as chief of the forge and press section, having charge of all presses and hammers manufactured in this country. He resigned to join the Clearing Machine Corp., Chicago, as assistant to the President. He goes from this position to take over the Kropp interests in Southern California.

In World War I, the new Kropp representative served over a year with the First American Heavy Tank Corps of the A.E.F.

His offices are in the Clem Lane Building at Wilshire and LeBrea Blvd., Los Angeles, Calif.

Allegheny Ludlum Board Elects R. M. Allen Vice President

At a meeting of the Board of Directors of the Allegheny Ludlum Steel Corp., held January 27, 1944, Russell M. Allen, formerly General Manager of Sales, was elected Vice President in Charge of Sales, according to H. G. Batcheller, President of the Corporation.

Mr. Allen started his career with the Allegheny Steel Co. in January 1920 as a production man in the mill. Two years later he entered the Sales Department, and in 1923 was transferred to Detroit as a member of the sales organization in that city. After two years of service in Detroit, Mr. Allen was made District Manager of the Chicago Territory which post he held until 1934 when he was recalled to Brackenridge, Pa., as Assistant Sales Manager. He held this position through the merger and formation of the Allegheny Ludlum Steel Corporation in 1938. In 1940 he was named General Manager of Sales.

Link-Belt Elects Vice-Presidents

W. C. Carter, president of Link-Belt Co. Chicago, announces the election by the Board of Directors, of two vice-presidents, effective Jan. 1, 1944.

E. L. Berry, vice-president and general manager of Link-Belt Ordnance Co., has been elected vice-president of Link-Belt Co., the parent organization.

Mr. Berry, who began his Link-Belt career in 1914, has for many years devoted his time particularly to matters of production and personnel. His new headquarters will be at the company's general office, 307 N. Michigan Ave., Chicago, Ill.

Richard F. Bergmann, company chief engineer, has been elected a vice-president of Link-Belt Co., with headquarters at the company's general office, Chicago, as heretofore.

Mr. Bergmann came to Link-Belt in 1924, through the purchase of Howe Chain Co., Muskegon, Mich.

Built to "Take It"

THE new Model 10VA will subject parts or assemblies 10 lbs. in weight to a "shakedown" test that stimulates the vibration conditions actually encountered in service. Tested for 50% overload. Vertical table movement. Features include:

New ALL AMERICAN VIBRATION FATIGUE TESTING MACHINE VASTLY Improved

- 4 ball bearings.
- "V"-frame provides 4-point support for table—relieves vibration mechanism of stresses.
- Automatic cycling—acceleration changed from a frequency of 10 cycles per second to 55 c. p. s. and back to 10 c. p. s., continuously and uniformly. Complete cycle takes one minute. Send for Bulletin 210.
- Cycling may also be controlled manually.

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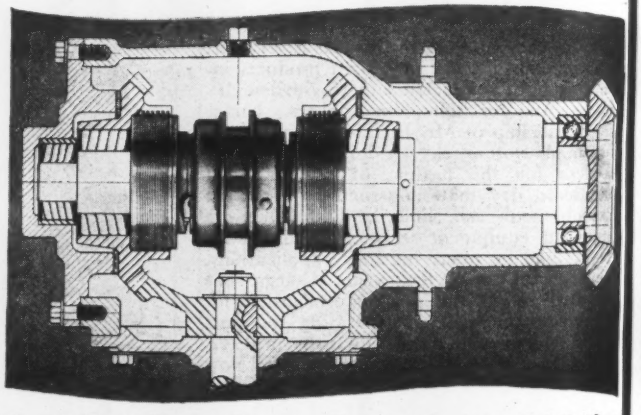
1014 Fullerton Ave., Chicago (14)

How PULLMORE CLUTCHES Help Keep Down Hoist Size and Weight



Send For These Power Transmission Bulletins

They show and describe how the PULLMORE Multiple Disc CLUTCH is so compactly installed in a hoist gear case that it helps reduce size and weight—while providing safe, smooth, rapid operation. Give dimensions, capacities and specifications. Show how exclusive PULLMORE features are being used to engineer ahead-of-competition products.

Rockford Drilling Machine Division
Borg-Warner Corporation
1307 Eighteenth Ave., Rockford, Illinois, U. S. A.
Pullmore Clutches are sold by Morse Chain Co. offices in principal cities.

• Keep Informed

John E. Martin has been appointed manager of Link-Belt Ordnance Co., with headquarters at the plant.

Mr. Martin started his Link-Belt career in 1927, and since Pearl Harbor has been assistant to Brigadier General G. M. Wells, War Dept., Washington, D. C.

Murdock Co. Appointed Kieley & Mueller Representative at Tulsa

Kieley & Mueller, Inc. North Bergen, New Jersey, since 1879 designers and manufacturers of automatic pressure and level control valves and equipment, have appointed the F. L. Murdock Co. of Tulsa, as exclusive sales representatives for the State of Oklahoma, and Daniel Orifice Fitting Co. of Houston for the States of Texas and Louisiana, according to A. E. Campbell, Director of Sales for K & M.

To Head Boots New Chicago Office

The Boots Aircraft Nut Corp. announced that William F. Arnoldy, head of the firm's Detroit office will also be in charge of its new Chicago office to be opened in the LaSalle-Wacker Building, 221 North LaSalle Street. Mr. Arnoldy will make his headquarters in Chicago.

Klippert Appointed Timken Steel and Tube General Sales Manager

Donald S. Klippert has been appointed Assistant General Manager of Sales of the Timken Steel and Tube Division, according to a recent announcement of The Timken Roller Bearing Co., Canton, Ohio. Klippert had been Cleveland District Manager of the Timken Steel and Tube Division.

Appointment of Robert P. Donnell to succeed Klippert as Cleveland District Manager was made at the same time. Donnell has been a Timken Steel and Tube Division Metallurgical Engineer specializing in aircraft applications for the past six years.

Klippert spent two years at Mount Union before attending the Case School of Applied Science in Cleveland where he received a B. S. Degree in Mechanical Engineering, an M. S. Degree in Metallurgical Engineering, and later the professional degree of Metallurgical Engineer. He has been associated with the Timken Company for eight years, having spent four years in Milwaukee and Chicago, in addition to four years as Manager of the Cleveland District.

Donnell, who was graduated from Susquehanna University with a B. S. Degree in Chemistry and Metallurgy, spent two years as Chief Metallurgist of the White Motor Car Company of Cleveland, Ohio, and for six years prior to that was in charge of Metallurgy for the Lycoming Division of Aviation Manufacturing Corporation.

• LATEST CATALOGS

New Morse Chain Catalog

Designed to supply post-war planners, design engineers, plant production men, and purchasing agents with the most recent and complete information on Morse Silent Chain Drives, a new catalog, prepared by the Morse Chain Co., is now ready for distribution. Included in the new Morse Catalog, in addition to the usual specifications and price lists, is entirely new material covering the advances and new developments made in the high-speed chain drives and other fields.

Continued on page 44

FORMULA FOR PERFECT *flexibility*

When you need Swivel Joints, you certainly want maximum flexibility with minimum torque.

Specify CHIKSAN Ball-Bearing Swivel Joints and you specify the only joint built to the formula for perfect flexibility:

BB_2 = Double rows of ball bearings.
EP = Effective Packing Element — self-adjusting for:
V/P = Pressure or Vacuum Service
LT = Resulting Low Torque.

CHIKSAN Ball-Bearing Swivel Joints are supplied in over 500 different Types, Styles and Sizes. Manufactured in steel, malleable iron, bronze and aluminum. Sizes from ⅜" to 12"; larger sizes to order for pressures to 300 lbs. and to 3,000 lbs. at 225° F. and for pressures to 500 lbs. at 700° F. End connections optional. Write for latest Chiksan Catalog and Engineering Data.

CHIKSAN REPRESENTATIVES IN PRINCIPAL CITIES
DISTRIBUTED NATIONALLY BY CRANE CO.

CHIKSAN TOOL COMPANY
CHIKSAN TRADE MARK REG.
Ball Bearing SWIVEL JOINTS for ALL PURPOSES
BREA, CALIFORNIA

The newly compiled material includes a section on new and simplified methods of drive selection based on latest Morse practice in high-speed drive design, and a complete section of engineering data covering chain and sprocket construction together with a comprehensive list of stock drives based on a new, quick method of selection.

Another addition to the usual material is a more complete section on installation and maintenance.

Condensed data covering other Morse power transmission equipment, such as roller chains, flexible couplings and free-wheeling clutches, serves as a supplement included in the new catalog.

Copies of the catalog, which is numbered Bulletin 43, may be obtained by contacting the nearest Morse office or by writing direct to the Morse Chain Co., Ithaca, N. Y.

Mechanical Feed Water Regulation

The Sixth Edition of the textbook, "Mechanical Feed Water Regulation for Boilers" by Professor E. P. Culver is now available.

The booklet covers the principles of boiler feed water control, and describes mechanical equipment available to meet various operating conditions. Differential pressure control and feed pump control are also discussed. Contains numerous illustrations, diagrams, and chart reproductions.

First published in 1938, the textbook has been popular with power plant engineers, operators, and engineering students. The current edition has been revised to keep its contents up-to-date.

Furnished free upon request to the Northern Equipment Co., 1945 Grove Drive, Erie, Pa.

Cochrane Reprint "Improvements in the Hot Process Water Softeners"

Cochrane's reprint "Improvements in the Hot Process Water Softener" covers a brief history of the development of this most versatile and popular method of feed water conditioning. Following the historical presentation the chemical reagents are discussed and new improvements both chemical and mechanical.

Illustrations show the possibilities of silica removal, reduction of organic matter and typical installations showing many adaptations of this equipment.

Copy of reprint from the original article appearing in the October 1943 issue of Iron and Steel Engineers is available. Ask for Reprint No. 30.

Reprints of Vibration Study Offered by Cooper-Bessemer

An 8-page reprint of a technical paper entitled "The Vibration Characteristics of 'Free-Free' Circularly Curved Bars" is being offered by The Cooper-Bessemer Corp., Diesel engine, gas engine and compressor builders. Reporting the outcome of an extensive study, the paper is considered a valuable contribution to engineering in connection with the behavior and design of piston rings.

Taken from a recent issue of the publication, "Journal of Applied Physics," the material was prepared and written under the direction of W. A. Pliskin and J. E. Edwards of Ohio University, and F. P. Bundy, Harvard University, with the collaboration of engineering officials of The Cooper-Bessemer Corp. whose interest in the preparation of the data also included the furnishing of accurately machined ring specimens used in various tests upon which the paper was based.

The discussion deals with the experiments conducted to determine certain vibration characteristics, the results of which furnish data that make it possible to calculate with reasonable accuracy, the frequency of vibration, parallel or transverse, of any incomplete, free-free, circularly curved bar of uniform cross section where its mechanical constants are known.

Reprinted on a good grade of paper and liberally illustrated, copies are available by writing to The Cooper-Bessemer Corp., Mount Vernon, Ohio.

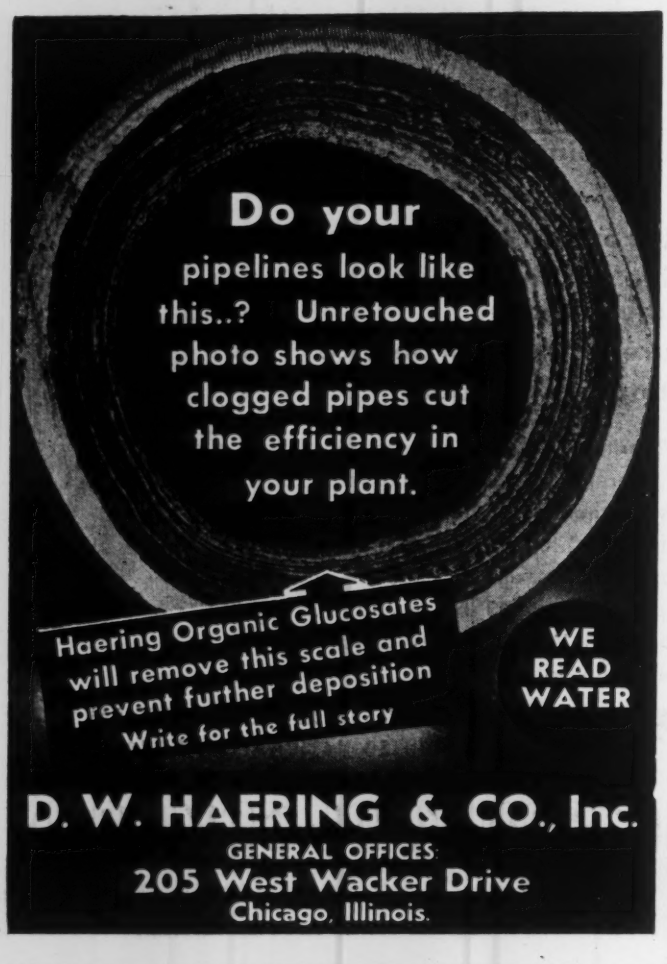
Book for Calculating Chain Drive Centers and Chain Lengths

In order to shorten the time required for calculating center distances and chain lengths of chain drives operating over cut-tooth wheels, Link-Belt Co. has computed and published a series of tables which give very accurate results.

The number of teeth in small sprocket wheel of the drive is given in the upper right-hand corner on the right-hand page of each spread of pages of this book No. 1991. The number of teeth in the large wheel appears at the top of each of the tables.

The body of table gives exact center distances for a chain of one-inch pitch and of the length listed in pitches in the first column. Center distance for any other pitch of chain may be obtained by multiplying the centers in table by the pitch.

A copy of this 20-page book No. 1991 may be had by writing direct to Link-Belt Co., Chicago, Indianapolis, Philadelphia, or other office of the company.



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- *BUSINESS CHANGES*
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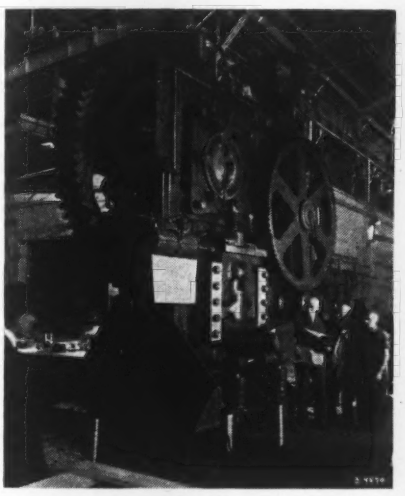
Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

Huge "Buffalo" Billet Shear for War Production

Production of forged steel parts will be accelerated when the giant billet shear illustrated starts working for Timken-Detroit Axle Co. at the Melvindale, Mich. plant.



Designed and built by Buffalo Forge Co., Buffalo, the No. 17 Billet Shear is believed to be the largest machine of its type ever constructed. Weighing over 80 tons, the machine has the well-known Buffalo electrically-welded "Armor-Plate" frame; a type of construction used by Buffalo Forge Co. for more than twenty-five years.

Every part of this machine is on a huge scale. Pressure on the knives is 4,500,000 pounds, making light work of cutting 10-inch steel bars at the rate of six cuts per minute. Clutch and hold-down are air operated, and automatic pressure lubrication is provided by a lubricator mounted on the machine.

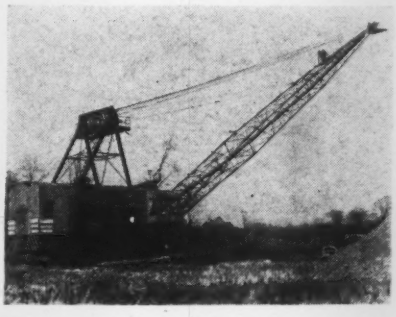
The whole unit is operated by a 125 HP motor which drives the flywheel thru multiple V-belts.

Inspecting the shear prior to demonstration to a number of industrialists last week are Gustav H. Zimmer, Designing Engineer, Buffalo Forge Co., Arthur Yates, Superintendent of Punch and Shear Department and Henry Lehman, Foreman. These three men have a total of 92 years' service behind them at Buffalo Forge Co., all spent in building machines of this type. Their interest in this "largest of all" models is naturally keen.

Giant Diesel Dragline Machine Walks as It Works

An interesting example of why Diesel engines are creating such widespread attention as power sources for industrial purposes as well as marine use is dramatically demonstrated in the surface coal stripping operations in the vicinity of Grove City, Pa., by a giant dragline that actually walks across country on two 27-foot pontoon "Shoes".

Powered by a relatively small, 6-cylinder Diesel engine supplied by The Cooper-Bessemer Corp. of Mount Vernon, Ohio, and Grove City, Pa., this 350-ton unit, including the 160-foot boom moves about by first elevating itself, then moving forward and down 7 feet ahead of its previous position.



Repetition of this action, made possible by means of large cam arrangements on each side of the unit, permits the machine to travel over rough, wooded terrain, cross streams and climb fairly steep slopes with ease.

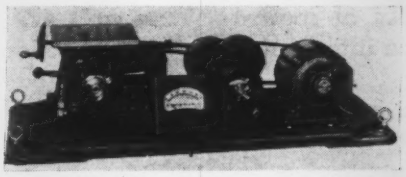
In addition to the direct connected drive, for locomotion, the Diesel unit also generates energy for two vertical electric motors totaling 80 horsepower which are used to operate the boom and dragline bucket, and supply current for the lighting system.

Used in surface coal mining operations, this unusual machine strips the top soil off coal deposits at a rate of 1,000 tons per day, preparatory to the actual coal stripping done by smaller, tractor-propelled shovels.

Despite the huge size and weight, this remarkable stripper unit is said to be extremely economical, requiring only a two-man crew and low-cost oil fuel for its Diesel engine operation.

New Vibration Fatigue Tester Has Automatic Cycling

A new addition to the line of vibration fatigue testing machines made by the All American Tool & Mfg. Co., 1014 Fullerton Avenue, Chicago (14), Ill., features automatic cycling. This new unit, designated Model 10V, handles parts or assemblies up to 10 lbs. in weight. Table has an area of 8″ × 8″ and has drilled and tapped holes for attaching work to undergo test. Table is mounted on V-frame, minimizing the stresses on the eccentric and connecting rod. Vibration mechanism runs in an oil bath.

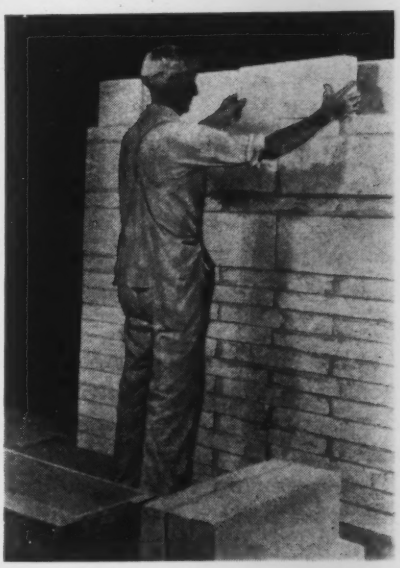


Vibration, in simple harmonic motion, is produced vertically. Acceleration, or rate of change of velocity, is controlled automatically by a device which changes the frequency from 10 cycles per second to 55 cycles per second (600 to 3,300 vibrations per minute) and back to 10 c.p.s. continuously and uniformly, the complete cycle requiring one minute. Acceleration can also be adjusted manually from 10 c.p.s to 60 c.p.s. Frequencies are accurately recorded on a sensitive electric tachometer. Maximum capacity is 37 g. (approx.).

Base is drilled at corners for bolting to a bench or studs set in concrete. Unit is powered by ½ h.p. 110 v. 60 cy. A.C. split phase motor. Ideal for plants making small electronic, electrical and mechanical parts. Simulates vibration conditions actually encountered by parts in service. Points out defects in design and construction materials and frequently makes possible savings through elimination of excess weight. Described completely in Bulletin 210.

New J-M Insulating Fireblok

Announcement has been made by Johns-Manville of a new Insulating Fireblok. This addition to its line of insulating refractory linings, is similiar in composition and properties to the four well-known J-M Insulating Fire Brick and is suitable for the same range of temperature conditions. But one Fireblok will cover more surface than five full sized Fire Brick.



The new Fireblok is manufactured in sizes—9″ × 24″, 9″ × 12″, 4-½″ × 24″, 4½″ × 12″. Standard Thicknesses 2½″, 3″ and 4½″ (4½″ only in JM-1620 and JM-20). Special sizes and thicknesses are available.

Johns-Manville points out that the new method of construction gives the Fireblok many advantages over the smaller sized Fire Brick units, among which may be noted:

Its large, convenient size and light weight assure fast economical installation.

It's easily cut with a saw and shaped with a rasp. Most special shapes can be either shop or field cut from standard blocks, reducing the inventory of special shapes.

The large size of Fireblok compared to the standard Fire Brick unit, materially reduces the number of joints, resulting in a thermally more efficient construction.

In reducing the number of joints, the Fireblok requires a minimum of mortar for bonding.

Continued on page 31

Now is the time to think about Molybdenum...

Taylor and White's great discovery which made possible high speed cutting was the greatest single development to help make mass production possible. The steel developed, commonly known as 18-4-1, served industry faithfully for over thirty years without a serious competitor.

In the early 1930's the first molybdenum high speed steels were used on a substantial commercial basis and, before the Second World War, about 25% of all tungsten high speed steels had already been replaced by molybdenum high speed steels on merit. This steady progress of logical replacement of the tungsten steels was interrupted by the war because of the tungsten shortage, when many industrial plants were forced to a sudden change to molybdenum steels.

Because of the stress of war production many concerns have never had an opportunity to satisfy themselves thoroughly as to the comparative merits of the molybdenum high speed steels. For those, in this category, who are inclined to return to the tungsten steels, we suggest a serious consideration of the following facts—molybdenum high speed steels perform as well as, or better than, tungsten steels—and they cost less.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue · New York City

MOLY

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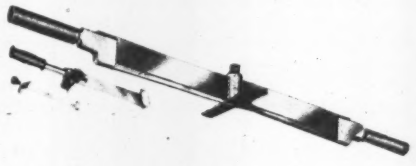
Fireblok comes in four grades—JM-1620, for exposed temperature to 1600° F., and as back-up to 2000° F.—JM-20, for use up to 2000° F., exposed or back-up—JM-23, for use up to 2300° F., exposed or back-up—JM-26, for use up to 2600° F., exposed or back-up.

Both Insulating Fireblok and Fire Brick are available for prompt shipment.

Announcing Complete Line of Torque Measuring Wrenches

The P. A. Sturtevant Co., of Addison, Illinois, announces a complete line of torque measuring wrenches comprising 8 models which range in size and capacity from small instrument building wrenches of a few inch pound capacity to great two-handled torque wrenches of 7200 inch pound capacity.



These wrenches are being widely used for gauging or measuring tortional force, as when equalizing the set of screws or nuts by tightening to a predetermined torque, or for measuring the frictional drag in motors or mechanisms.

They are widely used in both manufacturing and inspection departments. All are of the flat tapered beam type with fixed end and top scales and are guaranteed by the manufacturer to retain their accuracy permanently.

Airmotors Cancel Explosion and Fire Risks in Variable Speed Drives

Where explosive or inflammable gases or material are present great care must be observed as to the operation of gas or gasoline engines or electric motors otherwise a lot of trouble may ensue.

On the other hand, the compressed-air-operated airmotor offers a means of providing against these dangers.

Leiman Bros. are now making a rotary airmotor which offers a very wide range of speeds and horsepowers. The compressed air used may vary from 1 cubic foot per minute up and the pressure from 10 to 100 lbs. per square inch when the horsepower will range from .03 up as high as you may

Continued on page 32

ready-made skills

for trainees

THE BEGINNER, like the veteran, merely peels off the .003 or .002-inch thick laminations to make the required accurate fit . . . A Laminum shim places precision in any man's hands!

Shims cut to your specifications. Stock shim materials obtainable from your dealer. Write us for further information and shim application chart.

Laminated Shim Company, Incorporated • 93 Union St., Glenbrook, Conn.

B 2038

it's

LAMINUM

TRADE MARK

THE SOLID SHIM THAT *peels* FOR ADJUSTMENT

on

"MEGGER" *

INSULATION TESTERS

Production of "Megger" Insulation Testers at our Philadelphia factory has been accelerated and we have been able to reduce the time required to fill orders. At present we are building both "Meg" and "Super-Meg" types in ranges up to 100 and 1000 megohms with 500-volt hand-cranked generators. We continue to supply various other types and ratings of "Megger" instruments as formerly.

If you now have need for any type of "Megger" tester, let us know and we will give you the latest delivery information. Ask also for Bulletin 1735-M.

* *Trade Mark Reg. U. S. Pat. Off.*

JAMES G. BIDDLE CO.

1211-13 ARCH STREET • PHILADELPHIA 7, PA.

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want to go, while the speed may be 50 RPM or 1800 RPM or anywhere in between.

Here is offered power and speed under absolute control by the turn of an air valve just like you would do in pressing your foot on the gas control of your car to get speed and horsepower.

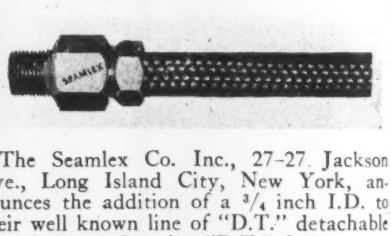
The motors are reversible by the same means of air valve control so that this, combined with all of the other desirable features, makes them available for power purposes wherever a compressed air supply is used even though no fire risk or hazard may be present. It furnishes a quick way of power testing more suitable than ordinary prime movers because of the close and easy regulation of power and speeds.

There is no electric wiring or other vulnerable parts to get out of commission easily and so many automatic machines now powered with electric motors might be made much more useful to their users by being equipped with these smooth running, trouble-free motors.

The motors come in a range of sizes and every problem of power driving should be considered in the light of their possible availability and simplicity of design and operation.

Leiman Bros. will be glad to furnish more information relative to your using airmotors with your machine or installation. Write them at 118-28 Christie St., Newark, N. J.

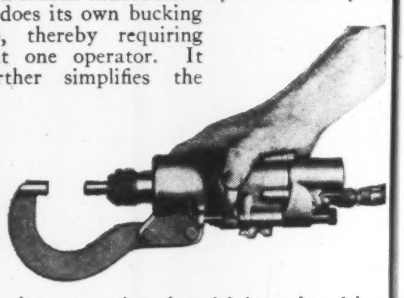
New Detachable Type Fitting for Flexible Metal Hose



The Seamlex Co. Inc., 27–27 Jackson Ave., Long Island City, New York, announces the addition of a 3/4 inch I.D. to their well known line of "D.T." detachable type fittings. Seamlex "D.T." fittings consists of only three parts. Their unusual simplicity, however is the key to their reknowned reliability. Seamlex "D.T." fittings provide triple safety against leakage. This is due to the metal-to-metal seat; the concentric guide (maintains tube in correct central alignment); the automatic stop (prevents stripping thread and damaging tube). Seamlex "D.T." detachable type fittings are especially recommended for all-around efficiency and economy at temperatures above 250°F. The Seamlex Company manufactures a complete line of flexible, seamless, all-metal hose as well as welded, all-steel diesel exhaust hose.

A One-Man Riveting Team

"A revolutionary development in aircraft riveters" is the claim made by the Ingersoll-Rand Co. in announcing this unique tool to manufacturers and repair men of the aircraft and similar industries. By means of a yoke, it does its own bucking up, thereby requiring but one operator. It further simplifies the



riveting operation by driving the driven head to a predetermined height, which is

• Keep Informed

adjustable, then automatically shutting off when this height is obtained. It is smaller and lighter than squeeze riveters of equal capacity. The two-stage throttle enables the operator to align or inspect the rivet with an initial, partial pressure before driving it home with full pressure.

The "Air-Buck" can be used to advantage wherever aluminum rivets up to $^{7}/_{16}$" diameter must be driven and where it is possible to use a yoke-type tool. Yokes of different sizes are easily interchanged.

A complete description of this riveter can be found in Ingersoll-Rand Company's new booklet, "Air Tools for Aircraft," which may be had by writing the company at 11 Broadway, New York, 4 N. Y., or any of its offices throughout the country.

Utilities Can Benefit by Use of Ingenious War Fastener

Public utilities, looking forward to postwar reconstruction of thousands upon thousands of their transmission lines, have found that wartime necessity has brought to the fore a fastening device which will serve to end most of their vibration troubles. This fastening device is the Elastic Stop Nut, a self-locking nut with an elastic collar which holds the nut firmly. Billions are in service under the most gruelling of fighting conditions.

Quoting from one of the many letters which his Postwar Planning Committee has received from industrial users of Elastic Stop Nuts who plan their use on civilian goods when such production is permitted, Mr. William T. Hedlund, president of Elastic Stop Nut Corp., makes this statement:

"With respect to postwar planning, one of the major problems of the electric utilities is the elimination of loose hardware on wood structures, particularly transmission lines. A nut which solves the vibration problem would have an application on all of this construction."

At present, the entire capacity of two huge plants, one at Lincoln, Nebr., and the other at Union, N. J., is utilized for our military program. Some of our large bombers use as many as fifty thousand of these Elastic Stop Nuts. Tanks, ships, and other armored equipment also use them.

After the war, the capacity of these plants can be utilized to contribute additional safety and economy of production in automobiles, railroad cars, home appliances, industrial and agricultural machinery, and many other uses.

Cooper-Bessemer's Production in Engine Horsepower Symbolized by Clever Carving

This miniature horse sculptured in hard wood which symbolizes the thousands of horsepower in Diesel and gas engines being produced by The Cooper-Bessemer Corporation, was carved from a single piece of cherry wood by W. J. Hayman, captain of the guards

Continued on page 34

. . . Arkwright's Tracing Cloths are Tops!

Take Arkwright's MATSURF Pencil Tracing Cloth for example. One draftsman will tell you he likes it because it will take pen or pencil lines with equal facility . . . because it erases so neatly. Another will say—because it makes such sharp, legible reproductions . . . stands up under rough handling. Try MATSURF yourself. You'll see that it is superior on all counts. Arkwright Finishing Company, Providence, Rhode Island.

Arkwright TRACING CLOTHS

AMERICA'S STANDARD FOR OVER 20 YEARS

at the Grove City, Pa., plant of this veteran engine-building concern.

Hobbyist Hayman, who has made numerous carvings in wood and soap in his spare time, never studied art in any form, yet his work would do credit to a professional sculptor.

According to Hayman, the high speed production methods used by his company to turn out Diesel engines and compressor units are not applicable to this type of artistic handiwork. For example, he worked at intervals for seven months on the horse carving before he was satisfied with the results. Using an assortment of ordinary knives and files, the carving process requires much skill and patience.

Hayman recently presented his horse statuette to B. B. Williams, chairman of the board, and it now rests on that executive's desk at the corporation's Mount Vernon, Ohio, headquarters.

American Brake Shoe Co. Starts an Experimental Foundry

The American Brake Shoe Co. announces the opening of its new Experimental Foundry at Mahwah, N.J. This is a different kind of pilot plant. Instead of operating on a miniature basis as do most pilot units, this plant is a full-sized foundry capable of handling castings up to 2000 pounds gross weight. But only experimental work will be done in the foundry.

While this plant had been planned as the next step in the Company's extensive program of metallurgical research which has been carried on for many years, the priority situation on construction materials had postponed erection. Then it was learned that the U.S. Army Air Forces, Wright Field, were concerned with the procurement of forgings for aircraft needs and were considering the possibility of substituting centrifugal and static castings to ease the situation. Since such castings required considerable piloting before they could be ready for production, Wright Field engineers approached Brake Shoe in the matter and arranged for the Army Air Forces to sponsor a priority application for the foundry. The construction was promptly authorized by the War Production Board and a Correlation Research Project was assigned the company by the War Metallurgy Committee of the National Research Council.

The steel for the building was procured in an unusual way. To save time and also to conserve new steel for direct war purposes, it was decided to buy an idle plant. One was found at Kansas City, Kan. It was dismantled and 250 tons of structural steel and sash were shipped 1200 miles to New Jersey. Here the building was re-erected, adjoining the company's Metallurgical Laboratory. It consists of two sections, one being the experimental foundry proper, with dimensions of 196′ × 82′. The other section is devoted to offices on its upper floor and to tool room, boiler room and storage space below.

Everything in the way of up-to-the-minute foundry equipment is in this plant. All standard safety devices have been included. For instance, a special dead front panel has been installed in front of the electrical dis-

Is this your line of thinking?

". . . in connection with our post-war plans we are confronted with certain manufacturing operations requiring clean air, and others involving grinding dust . . . we wish information on the use of your equipment . . ."

Shown above is an excerpt from a letter typical of many we are receiving today from manufacturers who are crystallizing their plans for V-Day manufacture.

There are many advantages to starting *now* to think about post-peace dust problems. For instance, priorities won't be automatically lifted when fighting stops and will then develop immediately a rush for needed dust control equipment that can't be intelligently supplied without careful planning and engineering.

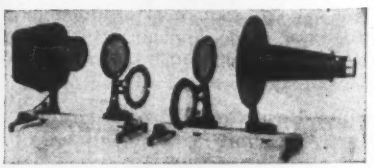
We are ready to go to work now to plan for your future needs. May we be of service? There is no obligation.

AMERICAN AIR FILTER COMPANY, INC.
103 Central Avenue, LOUISVILLE, KY.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

AMERICAN AAF AIR FILTERS

Polaroid* ... *Photoelastic Polariscope*

for Stress Determination



To the machine designer, photoelastic stress analysis is not only of value in the verification of calculations based on theoretical solutions, but also in the solution of problems where theoretical analysis is not available. Where weight and space must be conserved actual stress distribution is more important than stress indicated by theoretical analysis.

In the new model polariscope of 4¼" clear aperture, the parallel beam is collected by a rear element and condensed through a three component lens of the Cooke system. In the new larger unit (8¼" aperture) a four component lens of the Omnar system is used. *The image is sharp throughout the field, free of aberration, astigmatism and distortion.*

Literature of new model polariscope now available

POLARIZING INSTRUMENT CO., Inc.
1819 Broadway, New York 23, N. Y.

* *T. M. Reg. U. S. Pat. Off. by Polaroid Corporation*

tribution switches, and the motor generator room doors are protected by an electrical interlock.

For the duration this experimental foundry will be directly and indirectly in the service of Uncle Sam. Its immediate work will be devoted to:

(1) Development of pilot centrifugal and static castings practices for the aircraft industry.

(2) Experimental work that may be assigned by the War Metallurgy Committee of the National Research Council.

(3) Research projects that have a bearing on the war for the eight operating divisions of the American Brake Shoe Co.

(4) Then after the war the principal activity of the foundry will be experimental and research work for Brake Shoe and its customers. Naturally this work will be varied in its scope. Much of it will consist of investigation of new processes or products of interest to any of the company's hot metal divisions. A great deal of it will be to seek improvement of present products by changes in foundry practices, melting techniques, and rigging.

(5) Personnel training will be a major role of the experimental foundry. It is planned to put apprentices through a short training period in the foundry and then release them as they may be needed to the operating divisions.

(6) When it again becomes possible to employ professional engineers, a group of field metallurgists will be established to work in conjunction with the Experimental Foundry. These men will assist in developing new markets and new products for present markets, through a correlation of laboratory efforts with industrial needs.

(7) At all times the foundry is intended to be a changing, modern exhibit of good foundry practices. Interested visitors will be welcomed—metallurgists, research specialists, engineers, operating men, in fact anyone who thinks he may benefit by visiting the foundry. Thus Brake Shoe offers a practical, technical approach to general foundry problems.

Air Conditioning at American Car & Foundry Co.'s Plant

The latest advances in medicine and science, including modern air conditioning, to protect the health and morale of its thousands of workers are provided by the American Car and Foundry Co., at the dispensary set up at its Berwick, Pa., plant.

In one of the most efficient and best equipped dispensaries in the country, 300 to 400 cases are here treated daily by newest methods and medication in the care of minor wounds as well as more serious cases.

A Carrier self-contained air conditioning unit supplies conditioned air throughout the dispensary which includes the main treatment room, a physiotherapy room, a fully

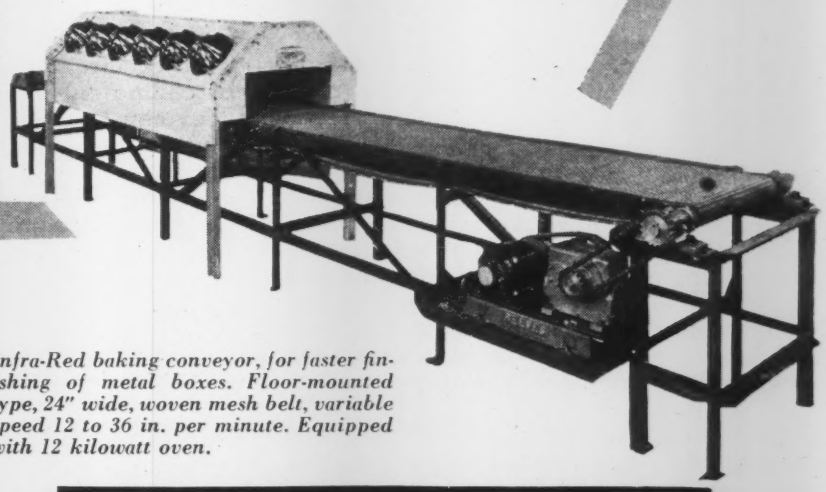
Continued on page 36

CUT FINISHING PLANT REJECTS WITH A G-W INFRA-RED SYSTEM

There's more resistance to chipping, scratching and smudging in the dry, tough finishes obtained with a G-W Infra-Red System. In addition it gives better control over all baking and drying steps—two reasons why a G-W System lessens work spoilage in the finishing process. A recent installation slashed rejects by 30%.

Six other advantages make radiant heat drying worth looking into. It triples drying production, saves up to half of your floor space, lowers power and fuel costs up to 75%, calls for less equipment investment, less overhead, and less manpower. Of course, in order to deliver these economies an Infra-Red System must be designed for your plant and synchronized to its operations — a job that's ably done by experienced Gifford-Wood engineers. They'll handle all design and production details, install a job under a performance guarantee.

But first find out whether the process will save time and money in your finishing room. Have a Gifford-Wood representative look over your plant, and submit a complete engineering report. Or get preliminary data from Bulletin 0-150 — yours promptly on request.



Infra-Red baking conveyor, for faster finishing of metal boxes. Floor-mounted type, 24" wide, woven mesh belt, variable speed 12 to 36 in. per minute. Equipped with 12 kilowatt oven.

GIFFORD-WOOD CO.

FOUNDED 1814

NEW YORK: Graybar Building — HUDSON, N. Y. — CHICAGO: 565 W. Washington St.

HEADQUARTERS FOR INFRA-RED BAKING AND DRYING

5538

FRASER-BRACE ENGINEERING CO., Inc.

Design, construction and installation
of complete plants and projects

Mechanical, Heavy Industries, Shipbuilding, Hydro-Electric Developments, Power Plants, Chemical and Refining Plants, Process Industries, Metallurgical Developments and Processes, Explosives, Plastics, Water Supply and Treatment, Sewage and Industrial Wastes Treatment.

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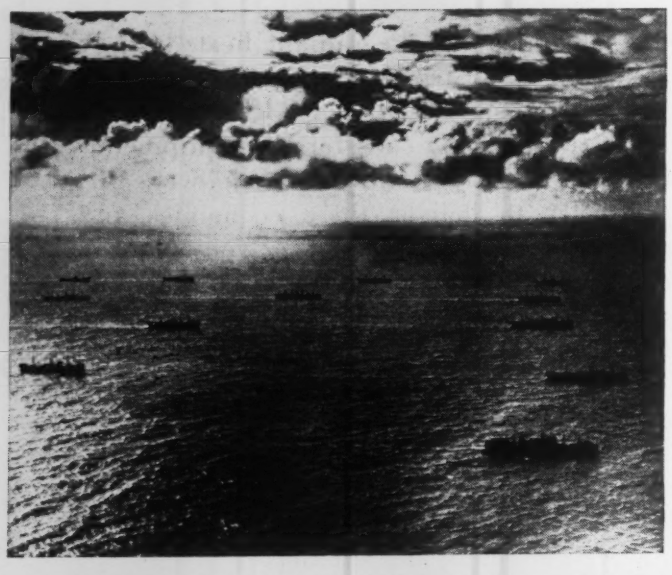


HUNDREDS OF PUMPS CONTRIBUTE TO "Safe Convoy"

Most of the major ship builders make sure their boats go through without delays or slow down due to pumping troubles, by calling on Goulds for their requirements. Here at Goulds they know they can get "*the* pump for the job" because Goulds builds all types—rotary, centrifugal, reciprocating—in a wide range of capacities and sizes.

Almost a century of experience gained in *the design and building of pumps only* is at your service in solving your liquid handling problems, large or small. There's no possibility of your getting a pump that "ought to do the job." From Goulds complete line and from Goulds knowledge of pump performance and manufacture, you can be sure the pump recommended is "*the* pump for the job."

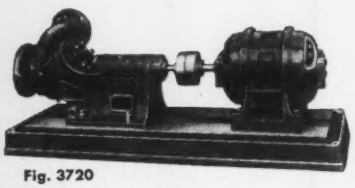


Fig. 3720

On your next pumping requirement, let Goulds engineers help you select the size and type that's best suited, from every angle, for your work.

Goulds PUMPS, INC.
SENECA FALLS, NEW YORK

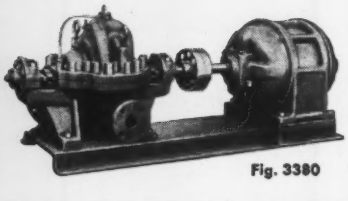
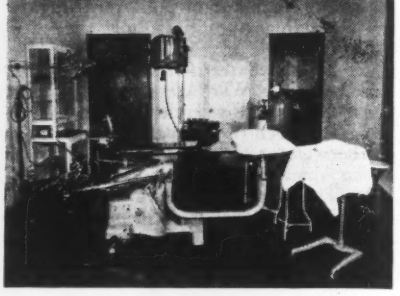


Fig. 3380

• Keep Informed

equipped emergency operating room, two physical examination rooms, the Chief Surgeon's office, and a one bed hospital for emergency cases.



A 24-hour service is provided in the infirmary with five nurses, the chief surgeon and an osteopath in full attendance all day. Employees are encouraged to report the most minor injuries or scratches, and due to the complete and efficient service the company has succeeded in reducing the loss of man hours, absenteeism and compensations to a minimum.

The air conditioning installation, according to the company physician, has been beneficial in reducing effect of shock from accidents, has aided in the recovery of injured employees and at the same time has increased the efficiency of the hospital staff.

Hydrostatic Test Press

The Denison Engineering Co., Columbus, Ohio, manufacturers of precision "HydrOILic" equipment, is announcing a recently developed hydrostatic test press which should be of special interest to those engaged in the determination of specifications.

The new press should find wide acceptance in the field of determining strength of materials, design, etc. It simplifies testing of drawing qualities of metals, fatigue in metals and alloys, and the influence of heat treatment. It also facilitates comparison of welding methods.

Coatings for metals such as paints, enamels, and plastics can be tested by alternate applications of pressure, simulating expansion and contraction. External pressure may be employed to determine the strength of all types of containers. Rapid porosity and seepage values are accurately obtained through uniform application of pressure.

• Keep Informed

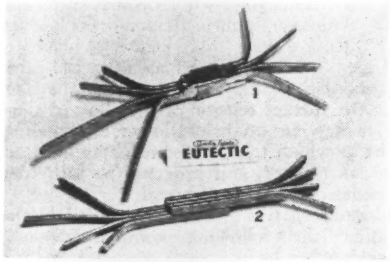
Impregnation of aluminum-magnesium alloys by boiling or soaking in liquid should be accomplished more efficiently under pressure possible with the Denison Hydrostatic Test Press.

The press features simplicity and convenience of operation. The clamping portion makes it possible to test articles of various heights without the inconvenience of re-tooling.

Substitutes for Critical Silver Solders

All silver-bearing alloys have increased in price since August, because manufacturers must now use domestic silver instead of the cheaper foreign product. This considerable increase renders the use of silver solders questionable, and many manufacturers are attempting to replace them with other materials, as suggested by Conservation Order M-199, as amended July 29, 1943.

The Eutectic Welding Alloys Company, 40 Worth St., New York, N. Y., has developed several alloys which offer all the advantages of silver solders, plus certain new ones—greater strength, firmer bonds, and greater hardness—yet contain very little or no silver.

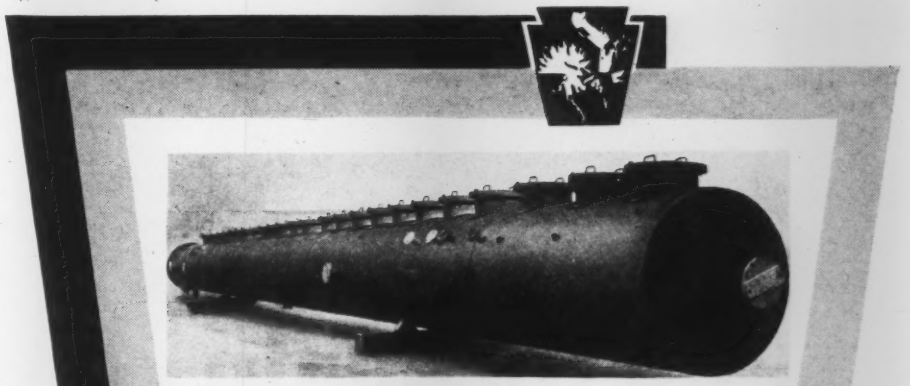


The new welding alloys are not, however, primarily designed as substitutes for silver solders. They can do many jobs that cannot be accomplished by any of the common soldering alloys. For example, a public service company had been using silver solder to join copper bus bars. Since the soldered joints were quite weak, it was necessary to hold the bars together with a brass collar, but even with this added bond, there was considerable loss of conductivity in the joint. Dissatisfied with this method, they tried "Eutectic" welding alloy rod No. 800 and found that, not only was the joint so strong that it was possible to discard the collar completely, but also the conductivity of the alloy made the unit a far better operating one than it had been before—with a great saving in the amount of alloy necessary for each unit. "Eutectic" alloy rod No. 800 gave a better, cheaper bond and saved tons of metal by eliminating the need for the brass collar. (See cut.)

Another example of the value of these alloys was the production of a pipe stem mold core, the construction of which is shown in the diagram. Originally, these cores were made from a single rod, flattened in the center.

This operation was, however, so costly and difficult that it was decided to make the core in three pieces, the flattened section being separate from the two ends. These pieces were then silver soldered together. This experiment proved to be a complete failure, since the solder softened up and the core came apart at the molding temperature. Finally, "Eutectic" alloy rod No. 16 was tried, with complete success. Not only did it

Continued on page 38



BETTER Steel Plate fabrication...

DOWNINGTOWN is equipped to design, lay-out, and manufacture almost anything in unfired pressure vessels . . . welded, riveted, or the combination . . . all based on 30 years searching experience.

Many of America's leading process industries have been, and continue to be, consistent and constant users and purchasers of steel plate fabrication by DOWNINGTOWN.

DOWNINGTOWN IRON WORKS
DOWNINGTOWN, PA.
WELDED and RIVETED PRODUCTS

One of R. H. Macy & Company's great fleet of trucks. Boots Nuts were tested on trucks like this.

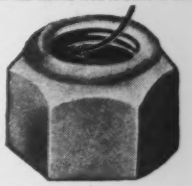
THE above is convincing proof that Boots All-Metal, Self-Locking Nuts can save thousands of dollars—wherever vibration loosens ordinary fastenings.

Boots Nuts will materially reduce maintenance costs by *eliminating* periodic tightening check-ups.

Boots are one-piece, all-metal, hence unaffected by the corrosive action of oil, water and chemicals. They can be used again and again without the accelerated locking loss of other nuts.

BOOTS SELF-LOCKING NUTS
"There's No Excuse for a Nut Shaking Loose"
Boots Aircraft Nut Corp. • General Offices, New Canaan, Conn.

The ALL-METAL lock is built in here

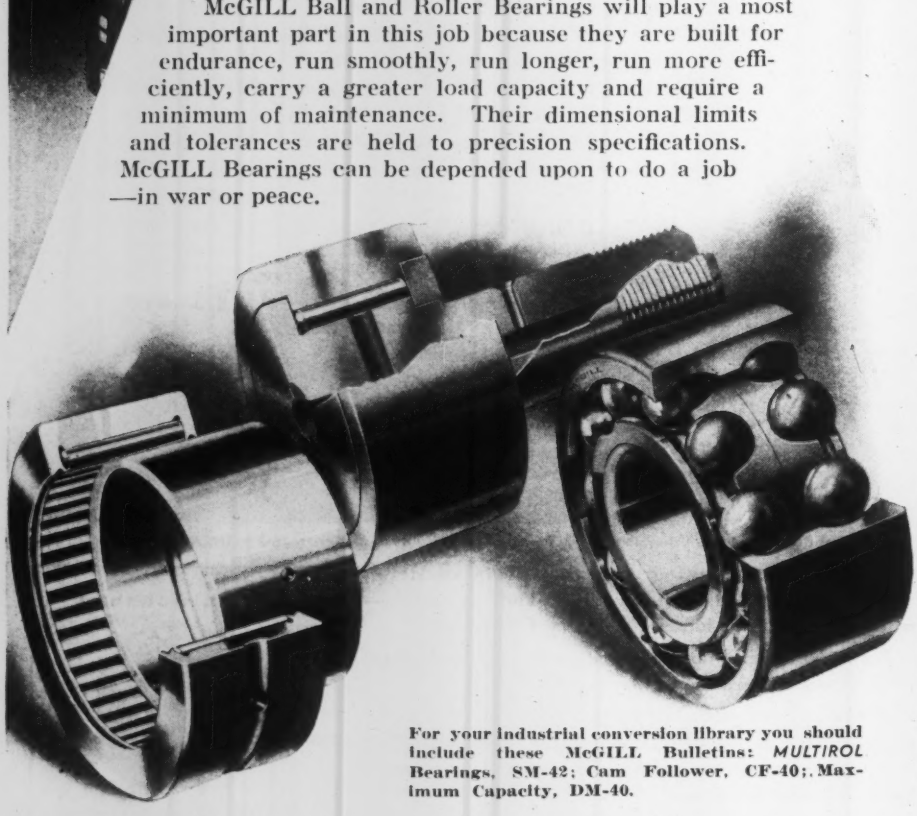


ROL-TOP. This nut, for the duration used exclusively on all types of aircraft engines, is the type of Boots All-Metal, Self-Locking Nut mentioned in the above statement.

American Industry's part in the rehabilitation of the post-war world will be one of tremendous dimensions. When the lights go on again and American plants are reconverted to peace time production, many manufacturers will find much of their pre-war machinery depreciated and obsolete.

After the rumble of war, which turned factories into Arsenals of Democracy, has quieted, a general replanning and re-equipping program will be necessary before we can begin to rebuild the shattered industrial regions of the world.

McGILL Ball and Roller Bearings will play a most important part in this job because they are built for endurance, run smoothly, run longer, run more efficiently, carry a greater load capacity and require a minimum of maintenance. Their dimensional limits and tolerances are held to precision specifications. McGILL Bearings can be depended upon to do a job —in war or peace.



For your industrial conversion library you should include these McGILL Bulletins: *MULTIROL* Bearings, SM-42; Cam Follower, CF-40; Maximum Capacity, DM-40.

McGILL MANUFACTURING CO., INC.
BEARING DIVISION — 1100 N. Lafayette St.
VALPARAISO - - - INDIANA

• Keep Informed

give a perfect bond with a tensile strength greater than that of the steel itself, but also, its remelting temperature—1750 deg. F.—was high enough to prevent any softening at the molding temperature. Furthermore, its binding temperature—1300–1600 deg. F.,—was low enough to permit rapid and easy application, and the finished joint was so smooth that practically no machining was necessary.

There are only two of many "Eutectic" alloys which can be used with all the known heating methods, particularly oxy-acetylene, oxy-gas, gas and air, furnace heating with or without a special atmosphere, induction, resistance, and even flux heating or dipping.

Furthermore, the alloys are available in convenient sizes—wires, strips, sheets and rods, and some in fine powder form. The principles of their application are similar to those of brazing in preparation, fluxing and heating.

Basically, the flow of these alloys is due to capillarity, with the added feature that they have a strong alloying effect on the parent metal, resulting in a far stronger bond than that obtainable with brazing or soldering. A bond that is, indeed, comparable in strength to fusion welding. The secret of their performance lies in their special composition and in the Autochemic fluxes which must be used with them. These fluxes, each of which is designed for a specific rod, assist in the penetration of the parent metal by the alloy, reduce the surface tension of the alloy to allow better flowing qualities, lower the melting point at which the "Eutectic" alloying reaction takes place, and prevent the formation of oxides on the parent metal.

Here are a few of the alloys available for welding the following commercially-used metals:

For brass, bronze, and copper; including aluminum bronze, everdur, beryllium bronze and beryllium copper: "Eutectic" alloy rods Nos. 18, 145, 180 and 800, having tensile strengths up to 57,000 lbs. p.s.i. and binding temperatures from 1290 to 1600 deg. F.

For steel, including high and low carbon alloys, chrome-molybdenum, stainless steel, tool steels, and tungsten carbide: Eutectic alloy rods Nos. 16, 18 and 145, having tensile strengths up to 117,000 lbs. p.s.i.

For nickel and nickel alloys such as inconel, nickel silver, and ambrac: Eutectic alloy rod No. 20 which has an approximate tensile strength of 95,000 lbs. p.s.i. and binds at 1290–1600 deg. F. The remelting temperature of this alloy is 1800 deg. F.

These new welding alloys have made possible considerable savings in a great many production applications, not only because of their *low cost*, but also, because of their *greater strength*, it has been possible to simplify joint design in many cases. This is particularly true of lap and butt joints, where it is possible to shorten the laps and eliminate the reinforcing fillets on the butt joints, thus saving large amounts of metal.

Another important factor is the smoothness of the joints which makes machining after welding practically unnecessary, many "Eutectic" welds being ready to go to work "as is."

Finally, it is to be noted that, not only do these alloys save silver, but, in many applications where tin-lead solders were used, their substitution will result in a substantial saving of tin.

Third Star Added to Army-Navy "E" at Barberton Plant of B&W

The Navy Board for Production Awards has granted the Barberton Plant of The Babcock & Wilcox Co. a new Army-Navy "E" Pennant with three stars affixed. An-

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nouncement of the renewal was made on December 29 in a letter from Admiral C. C. Bloch to A. G. Pratt, president of B&W; the renewal dates from October 2, 1943.

The Navy "E" Flag was awarded to The Babcock & Wilcox Co. in April 1942; this was later changed to the Army-Navy "E," and renewals, for maintaining high standards of achievement, have been granted every six months.

Champ Retains Title

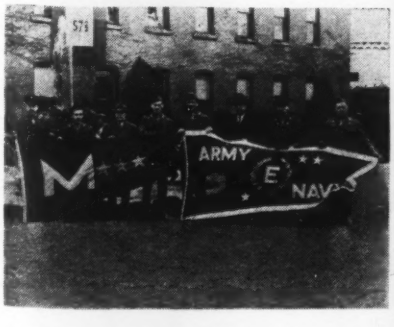
Vera Anderson, 20 year old welderette delux at Ingalls Shipbuilding Corp. in Pascagoula, Miss., successfully defended her title as the world's woman arc welding champion when she recently defeated the challenger Mrs. Edna Slocum of Moore Dry Dock, San Francisco.

In the roped off "ring" on the platen at Ingalls the champ and challenger "fought it out" on the basis of welding speed and quality in a variety of tests including overhead and vertical welding.

Miss Anderson was recently chosen one of the ten outstanding women of the year by the Associated Press and by a national woman's magazine after winning her championship crown last year.

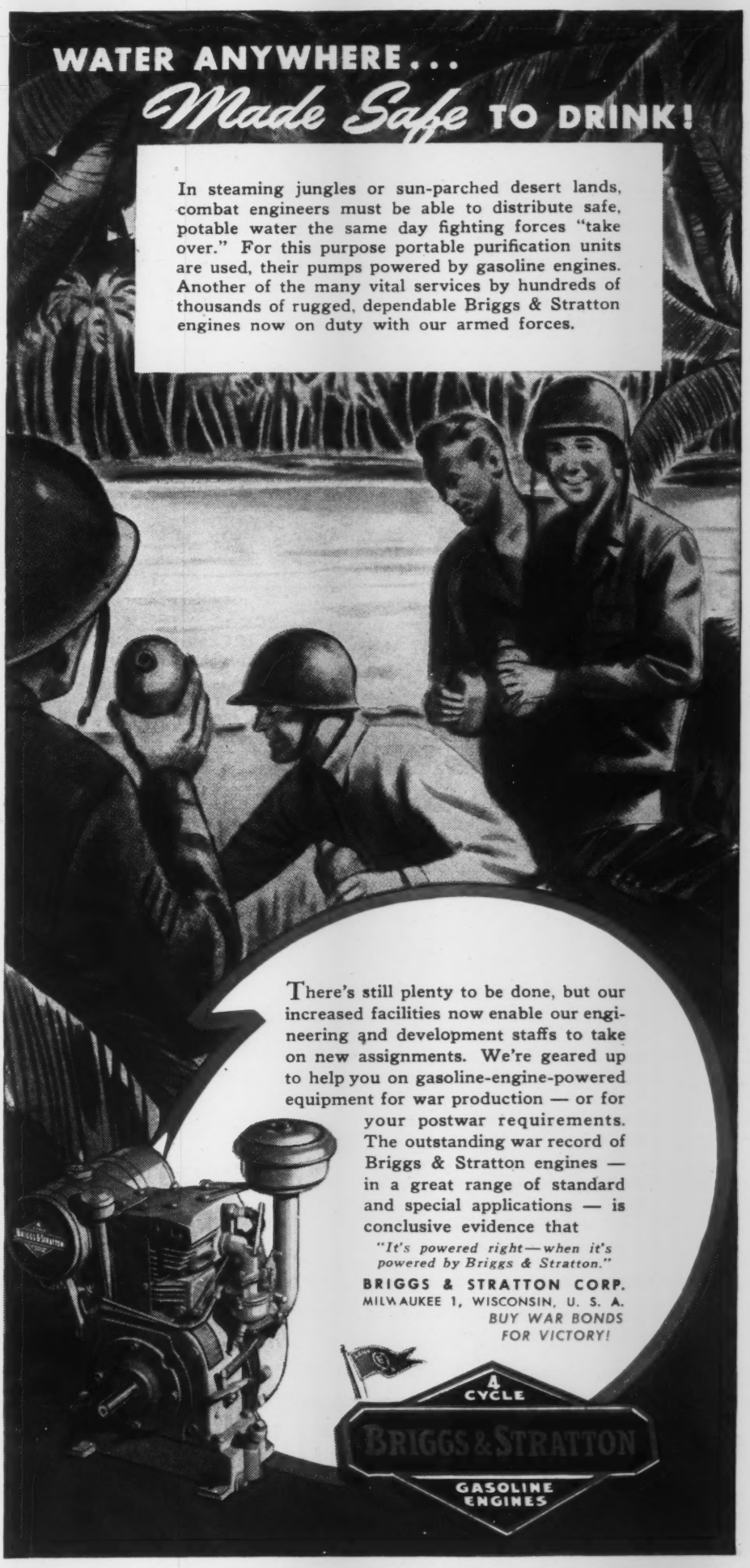
Double Award for Jenkins Bros.

Two flags were raised over the Jenkins Bros. plant in Bridgeport, Conn. on March 4th, each bearing an additional star. The new flags represent the third award by the United States Maritime Commission, and the fourth award by the Army and Navy to the workers of Jenkins Bros. for excellence in production of valves for cargo and fighting ships.



The flags were hoisted in a simple ceremony which took place on the lawn of the plant. The new "M" and "E" pennants were raised by six returned Army men back at their old jobs at Jenkins Bros. There were Edward

Continued on page 40



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SPRING TESTER

Fast, Accurate and Inexpensive

Using any accurate torque wrench and its measuring element, this inexpensive spring tester measures the recoil of springs up to 7" (free length) and 2½" in diameter when compressed to any predetermined length. As easy to "set" as a vernier scale; as easy to operate as a light arbor press; and as easy to read as a school ruler—no multiple dials, no relative readings, no complicated computations. Just pull down the torque wrench handle, and take the direct reading when the built-in tone device sounds. Enables anyone to inspect, test, check or measure the recoil of springs in a few seconds . . . to accurately match sets of springs (as valve spring of engines) in a few minutes.

Widely used for testing springs in laboratories and in heat treating, inspection, assembly and repair departments to eliminate costly guesswork in building and maintaining automotive and aircraft motors. (Note: Torque Wrench NOT INCLUDED, unless specified.)

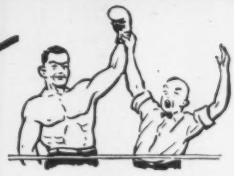
Write for Bulletin ST-17

P. A. STURTEVANT COMPANY
ADDISON, ILLINOIS

P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

WISCONSIN Air-Cooled ENGINES

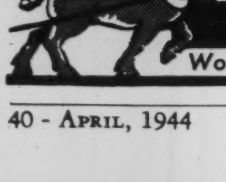
Check



FOR STAMINA AND POWER on Your Equipment!

You want horsepower . . . yes. But over and above that you *must* have STAYING POWER. You get both in Wisconsin heavy-duty air-cooled engines. There's plenty of stamina here for slugging away, day in and day out, on those tough jobs that must be licked on schedule. Wisconsin heavy-duty design and construction can "take it".

Most H.P. per pound



WISCONSIN MOTOR Corporation
MILWAUKEE 14, WISCONSIN, U. S. A.
World's Largest Builders of Heavy-Duty Air-Cooled Engines

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O'Brien, shipping room; Leocricio Sendra, foundry; Alex Szacolcai, yard gang; Francisco Villafana, tapping department; Paul Edwards, finishing department; and Luigi Marrocchi, yard gang (shown in illustration, left to right).

Bernard J. Lee, vice president in charge of manufacturing, spoke briefly at the ceremony. "These flags," he said, "represent seven merit awards to our workers. Our men and women have worked hard by night and by day to meet the quotas of war materials set by the Army and Navy and Maritime Commission. Each ship in Uncle Sam's giant shipbuilding program must have its complement of valves when it goes down the ways. Our workers have done their utmost in turning out this vital equipment. We do not think the war is over, by any means. We expect to win it, sure, but we're not going to let up on our war work here at this factory while America and her Allies are building ships for Victory, and while these ships need our valves. Our workers may well be proud because they are responsible for these flags flying at the Jenkins Bros. plant. There aren't many plants in the whole country that can boast of seven awards."

"E" Flag Presented to Cochrane Corp.

The award of the Army-Navy "E" for excellence in production records was made recently to the Cochrane Corp. at exercises held at the plant, 17th St. and Allegheny Ave. High officials of the Army and Navy took part in the program, which was attended by the employees.

Among those who took part were Commander Floyd B. Schultz, U.S.N., who presented flag; Joseph Tapley of the employees committee; Major Victor W. Smith, U.S.A., who presented Army-Navy pins, and Percy S. Lyon, President and General Manager of the corporation.

The firm has been engaged in the manufacture of power plant equipment since 1863. Included in the firm's output are water conditioning equipment, filters, blow-off systems, steam specialties and flow meters.

A buffet luncheon was served to employees and guests after the ceremonies.

Vari-Typer Corporation Opens New Display and Exhibit

Army, Navy, Foreign Government and City Officials inspected the new showroom and school opened by Ralph C. Coxhead Corp., manufacturers of Vari-Typer Composing Machine, at 409 Madison Avenue, New York.

Due to war-time schedules and government contracts, enlisted personnel from many branches of the Army and Navy are being trained in the operation and maintenance of the Vari-Typer.

Among the many outstanding features were the hydraulic gear pump and the fuel valve used in Aircraft, which the Ralph C.

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Coxhead Corp. is manufacturing for the Army Air Force. An additional outstanding feature was the Engineering Model Vari-Typer which attracted considerable attention at the opening. This machine, lettering on an 18 foot tracing, was in constant operation during the display.

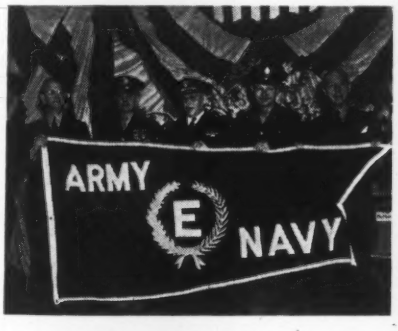
In order to accommodate those concerns given over to war-time schedules and post-war planning, the new showroom and school will continue to operate on an extended schedule and demonstrations of the various features of the machine will be given for an indefinite period.

Illustration shows, left to right—Staff Sgt. A. Wasilevsky, Cpl. Charles Shaup, Stuart P. Coxhead, Vice-President of the Corporation and Staff Sgt. E. W. Wheeler.

Hanlon-Waters, Inc., Awarded Army-Navy "E"

At an impressive ceremony held at the company plant in Tulsa on January 31, Hanlon-Waters, Inc., builders of the equipment for the Army's famed "portable pipe line," were presented with the Army-Navy "E" Award for excellence in production.

Hanlon-Waters and its employees in winning the nation's highest and most coveted production award, join the exclusive company which numbers less than three per cent of the war industries which have been so honored.



Yet, at the same time the company was honored, the employees dedicated themselves to even more intensive participation in the war effort. It was announced at the presentation ceremony that the company's employees had subscribed 100 per cent to the Fourth War Bond drive.

Hanlon-Waters started production of this army contract about eighteen months ago after paving the way with considerable research and testing. Since then, the portable pipe line pumping units have been sent to battle zones around the world and have aided materially in keeping airplanes, tanks and other motorized units in operation.

The award program was held in the company's only recently completed new building, which will house the final assembly and crating departments. Col. H. A. Montgomery, Executive Officer, Supply Division, Office of the Chief of Engineers, in making the award stated that the pumping units manufactured in the Hanlon-Waters plant, are being used by our armed forces and those of the Allies "in every theatre of operations throughout the world."

President M. F. Waters, receiving the award on behalf of his company, thanked the employees for their "unselfish devotion to their work" and predicted that in the future they will endeavor to surpass their outstanding production records.

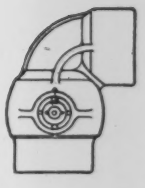
On behalf of the Navy, Capt. E. L. Woodside, Commanding Officer, Naval Ammunition Depot, McAlester, Oklahoma, praised the company for its fine accomplishment and

Continued on page 42

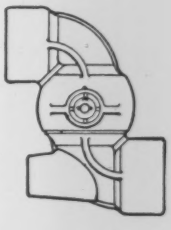
AIR, COOLANT AND CUTTING FLUID LINES FOR MACHINE TOOLS WITH *Controlled Flexibility*

Hose lines carrying air, coolant and cutting fluids need no longer be draped in festoons over your machine tools . . . and held in place by wire or string!

Replace your leaking air lines, using CHIKSAN **Ball-Bearing** Swivel Joints, pipe and short lengths of air hose you have on hand. Counterbalance Swivel Joints automatically swing air lines out of the way, yet within easy grasp.



Chiksan **Ball-Bearing** Swivel Joints for coolant and cutting fluid lines automatically keep these lines where you want them. Just swing the line into position and it "stays put."



Chiksan **Ball-Bearing** Swivel Joints for machine tools eliminate hose replacements for the life of your machines. They are typical examples of how Chiksan Joints solve every problem where controlled flexibility is required. Over 500 different Types, Styles and Sizes for every purpose. Write for latest Chiksan Catalog and Engineering Data.

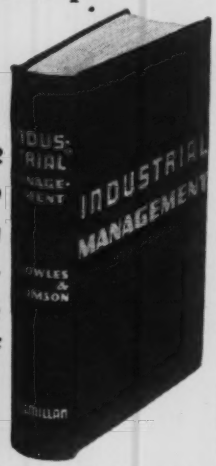
CHIKSAN REPRESENTATIVES IN PRINCIPAL CITIES

CHIKSAN TOOL COMPANY

Ball Bearing SWIVEL JOINTS for ALL PURPOSES

BREA, CALIFORNIA

Experienced help on today's and TOMORROW'S Management problems



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- records, files and indexes, storeskeeping, routing of work, coordinating slow and fast work, special systems of production control for different kinds of industries, shipping, departmental problems, estimating, planning, cost control —
- the selection and training of personnel, merit rating, evaluation and classification of jobs, compensation schedules, delegation of authority, health and safety of personnel, motion and time studies, avoidance of friction and overlapping of work.

You will find in this book workable answers to these and hundreds of other management problems—large and small, many new ideas and much practical data not heretofore generally available.

The sections in this book on personnel and on production control and costs are also available in separate volumes.

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read a citation from the War Department conferring of the Army-Navy Production Award for "making an outstanding contribution to victory".

The "E" pins were presented by Private James C. Hiett, veteran of the fighting in Africa and Sicily, to Mrs. Mary Seawright and Bert Sims, who received them on behalf of the employees. P. H. Bohart, president of the Chamber of Commerce of Tulsa presided at the ceremony.

Edward Plant Awarded Another Gold Star for Maritime "M" Pennant

The Edward Valve & Mfg. Co., Inc., East Chicago, Indiana, has been awarded a second Gold Star to be added to its Maritime "M" Pennant, Rear Admiral Howard L. Vickery of the United States Maritime Commission has announced.

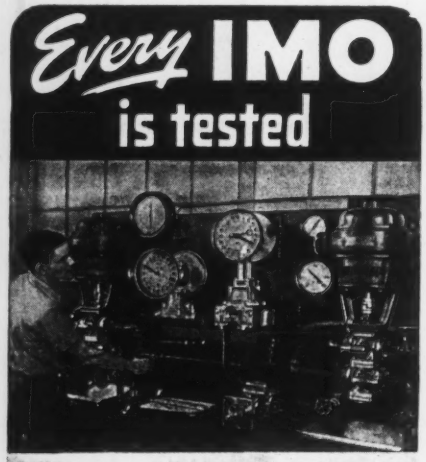
The award was for continued excellence in the production of cast and forged steel valves. The Edward plant was among the first in the Chicago area to win the Maritime "M" pennant. With the new Gold Star goes Labor Merit badges to all employees who have been added to the Company's payroll since the last Star award.

Cherry Rivet Reaches New Production High

Among the western manufacturing concerns devoted entirely to war production materials, Cherry Rivet Co., Los Angeles, has reached an all time high in production according to the Company's president, William B. Hubbard.

"The present daily output of Cherry Rivets," Hubbard said, "is five times what it was a year ago. Although the number of users has continually increased during this period, our production schedule now places all users on a current delivery basis. Immediate deliveries are being made on new orders. We are proud of the job our engineering and production personnel have done to make this situation possible."

While production has steadily increased, prices of Cherry Blind Rivets have gone down. In August 1942 the average unit price was $4\frac{1}{2}$ cents. Four downward changes have brought the present average price to $1\frac{1}{2}$ cents, making it practical to use these rivets in more of the difficult riveting jobs which may not necessarily be true blind spots.



Each De Laval-IMO pump is tested under full load and every purchaser of a De Laval-Imo pump is, therefore, assured that his pump before shipment has demonstrated its ability to handle oil of given characteristics under the specified conditions. This is one of the ways in which our aim always to build the best is achieved in practice. • Ask for Catalog I-113.

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RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

• Keep Informed

The blind rivet is so-called because it can be installed where there is access to only one side of the work. No bucking bar is required. Cherry Blind Rivets, made of aluminum alloy, have been used extensively in the manufacture, servicing and field repair of all types of aircraft. New types of Cherry Rivets are now being developed to meet special applications in other industries where blind or difficult riveting problems exist.

Army-Navy "E" Will Complete "Grand Slam" in Government Awards to Cooper-Bessemer

Mount Vernon, O.—Unusual recognition for outstanding war production was noted here today in the announcement that The Cooper-Bessemer Corp., with plants here and in Grove City, Pa., is to be awarded the Army-Navy "E".

This new honor will complete a "grand slam" in government awards which began August 29th, 1942, with presentation of the United States Treasury Department's Minute-Man flag for 100 percent participation of its employees in War Bond subscription, followed by award of the Maritime Commission's "M" burgee on December 18th, 1942, for outstanding production of diesel engines and major engine parts for which they have subsequently received two gold stars for continued achievement on August 3rd, 1943, and January 25th, 1944.

This 111-year old concern, which is now to receive the Army-Navy "E" award, has been one of the most important factors in the outstanding development and manufacture of diesel power for propulsion and auxiliary service in many types of cargo, combat and salvage vessels. The company is also recognized as a major producer of diesel and gas operated compressors for the petroleum and synthesis industries. In addition to their extensive output of engines, Cooper-Bessemer is the largest manufacturer of steam cylinder castings for Liberty ships and is turning out an increasing volume of machine tool castings here and at their Grove City, Pa., plant.

In commenting on the firm's exceptional record, Gordon Lefebvre, president and general manager of the company, paid high tribute to Cooper-Bessemer employees when he said, "The conscientious effort of every worker in both plants has earned them this proud distinction. With such fine spirit and willingness throughout the organization, we are going ahead to even greater achievement that will help speed the day of total victory."

Third "E" Star for De Laval

The De Laval Steam Turbine Co. of Trenton 2, N. J., one of the first manufacturing plants to receive the Navy "E" Burgee, has been awarded a Third "E" Star in recognition of the third renewal of the "E" for meritorious service on the production front. To date this company has delivered or has on order, a total of more than 15,000,000 horsepower of marine propulsion gears, in addition to large quantities of turbines, centrifugal pumps and IMO oil pumps used by the Navy.

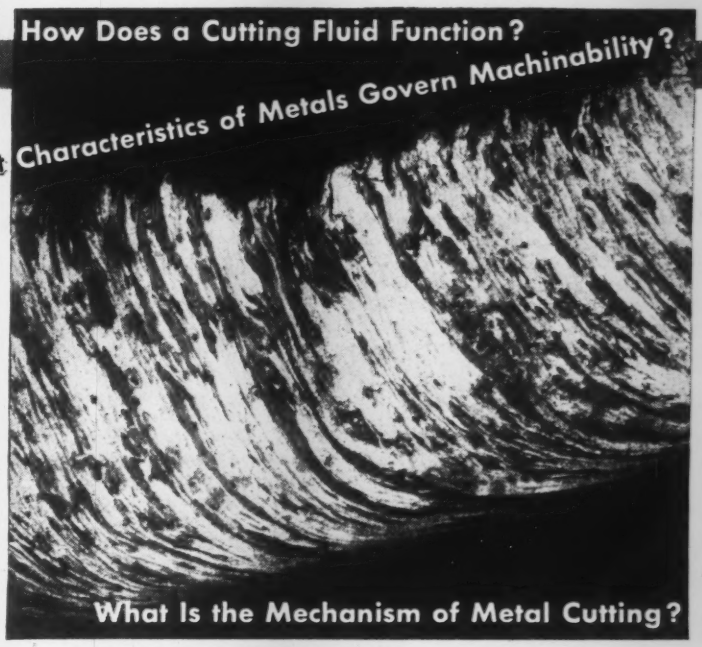
• BUSINESS CHANGES

History of the Laclede-Christy Clay Products Co.

The Laclede-Christy Clay Products Co. had its inception in 1844 when a St. Louis firebrick manufacturing company was founded. In 1856, James Green, contractor

Continued on page 44

Consider the Lowly Chip..



What Knowledge Its Gnarled Features Hide!

We're moved to poetic expression when we contemplate the great advances in metal-working which become possible as more and more is learned about the formation of a metal chip. Too long the chip has been taken for granted as just something which happens when you cut metal. Scientific investigation is bringing to light data which may greatly alter present day conceptions of tool angles, depth of cut, tool speeds, cutting fluids and other factors which are a part of metal cutting.

Through study of the metal chip come further answers to three fundamental questions: "What is the mechanism of metal cutting?" "What characteristics of metals govern machinability?" and "How does a cutting fluid function?"

We at D. A. Stuart Oil Co. are probing these mysteries with all the tools and techniques science makes available. We don't know all the answers yet, but we're learning them fast. As our research engineers inch closer and closer to the truth about the metal chip, their findings are reflected in improved cutting fluids—*to do a better job for you.*

We invite you to write for our new free booklet, "The 577th Oil," which contains twenty-two case histories, typical examples of how Stuart Oil Engineering is solving production problems (like your own), as well as other valuable metal-working data. Please state your name, company and title.

A REQUEST OF STUART CUSTOMERS
Containers of all types are critically scarce. We urge you to cooperate with the W.P.B. program to conserve containers by observing these four rules for handling drums.
1. Do not drop.
2. Use a little oil to avoid stripping threads in removing plugs.
3. Replace plugs carefully when drum is empty.
4. Keep drums under cover when emptied.

Thred Kut · CODOL · Super-Kool · DA
EXCELENE · SCC
D. A. STUART OIL CO.
LIMITED
2741 SOUTH TROY STREET
CHICAGO 23, ILLINOIS
ESTABLISHED 1865
Warehouses in Principal Metal-Working Centers
STURACO · SOLVOL · KLEEN KUT

Accurate, easy-to-read photo-exact copies of orders, letters, blueprints, drawings, accounting records, technical data or sketches reproduce originals in detail. Eliminate errors in copying that cause misunderstandings and delays! Make photo-copies for all departments and branches. Even blueprints copied without tracing. Any girl or boy quickly makes A-PE-CO photo-copies of anything written, printed, drawn or photographed. No technical training needed. A-PE-CO is indispensable in thousands of America's industries. You can use it to avoid mistakes and save time.

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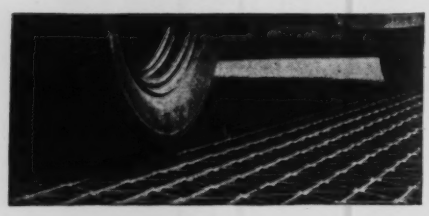
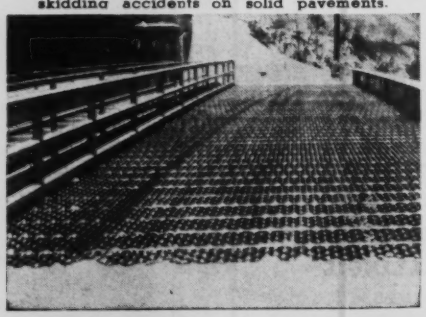
The Open Steel Bridge Pavement
Lightweight • Non-Skid • Economical
One-Piece • Self-Cleaning • Permanent



IN CLEANLINESS THERE'S SAFETY
80% open IRVING DECKING can't collect snow, grease, oil or water that cause skidding accidents on solid pavements.



ESTABLISHED 1902
IRVING SUBWAY GRATING CO., INC.
HOME OFFICE and PLANT: 5010 27th STREET
LONG ISLAND CITY 1, NEW YORK
WESTERN DIVISION: FOOT OF PARK AVENUE
EMERYVILLE 8, CALIFORNIA

and furnace builder, purchased a half interest in this company to insure a constant supply of firebrick for his needs. He became the owner in 1863, and the business was incorporated under the laws of the state of Missouri as the Laclede Fire Brick Manufacturing Co. in 1869.

The year 1876 marked the contemplated construction of an extensive sewer system in St. Louis which necessitated the use of vitrified clay products. This induced Mr. Green to secure the services of an expert in the manufacture of this type of product, thus marking the beginning of the Vitrified Clay Products Division for the manufacture of sewer pipe.

For the ensuing twenty years, the Company grew steadily in importance in the industry, and in 1888 it pioneered in the manufacture of firebrick by the drypress method. This innovation was scoffed at by contemporaries. Today, however, it is the most economical and most widely used method of firebrick manufacture.

As early as 1902, John L. Green, son of the founder, realized the importance of the scientific approach toward the advancement and solution of refractory problems. That year a chemist was hired and a Research Department had its inception. It has since become a highly specialized department, responsible for the development of many now reputable and outstanding refractory materials.

About 1905, the Laclede Company pioneered in the development of high alumina refractories through the use of bauxite. Later, Laclede-Christy was the first to produce refractories from Missouri diaspore.

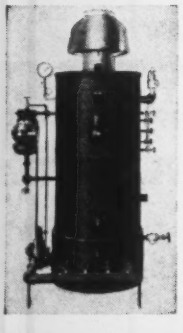
In 1907, the Laclede Fire Brick Manufacturing Co. and the Christy Fire Clay Co., the latter engaged primarily in the manufacture of refractories for the glass industry, were consolidated and incorporated under the laws of the State of Missouri as the Laclede-Christy Clay Products Co.

One year later, a division for the sale of suspended flat-arch refractory construction

Will you have processing STEAM this summer?

Will your plant or building shut down its central steam plant to conserve fuel during the summer months? If so, *you should act at once* to obtain an independent source of summer steam for processes which require it. (W.P.B. approval must be secured . . . and boiler deliveries are far from prompt!) For dependable, constant-pressure steam with minimum attention we recommend the—

KANE GAS-FIRED STEAM BOILER



This boiler takes very little room and can be placed right next to the process equipment it serves. Patented double-diaphragm valve throttles gas input in exact proportion to steam demands and maintains desired operating pressure. Sizes 1 to 30 H.P. Built to A.S.M.E. standards for 100 pounds pressure. Higher pressures to order.

MEARS-KANE-O'FELDT INC.
Manufacturers of Automatic Steam Boilers for over a third of a century.
1903-1915 EAST HAGERT STREET, PHILADELPHIA 25, PA.

COMING MEETINGS AND EXPOSITIONS

During the next three months

APRIL

2–5	**The American Ceramic Society, Inc., Second War Congress and 46th Annual Meeting, Hotel William Penn, Pittsburgh, Pa.**
3–5	**The American Society of Mechanical Engineers, Spring Meeting, Hotel Tutwiler, Birmingham, Ala.**
3–7	**American Chemical Society, Cleveland, Ohio**
5–7	**Society of Automotive Engineers, National Aeronautic Meeting, Hotel New Yorker, New York, N. Y.**
13–14	**Midwest Power Conference, Palmer House, Chicago, Ill.**
20–21	American Institute of Mining and Metallurgical Engineers, Joint Conference, Open Hearth Steel Comm. and Blast Furnace and Raw Materials Comm., William Penn Hotel, Pittsburgh, Pa.
25–28	**American Foundrymen's Association, 48th Annual Meeting and Third War Production Foundry Congress, Memorial Auditorium, Buffalo, N. Y.**
27	Institute of the Aeronautical Science, Light Plane Meeting, Rackham Memorial, Detroit, Mich.
28–29	Society for Advancement of Management, Reabsorption and Relocation of Service Men and War Workers, Drake Hotel, Chicago, Ill.

MAY

1–2	American Mining Congress, Coal Mine War Conference, Cincinnati, Ohio
14–16	American Institute of Chemical Engineers, 36th Semi-Annual Meeting, Hotel Cleveland, Cleveland, Ohio
17–18	Society of Automotive Engineers, National Diesel F. & L. Meeting, Hotel Knickerbocker, Chicago, Ill.
17–18	Society for the Advancement of Management, Hotel Statler, Washington, D. C.
22–24	American Gear Manufacturers Association, Westchester Country Club, Rye, N. Y.
24–25	American Management Association, Insurance Conference, Hotel New Yorker, New York, N. Y.
25	American Iron and Steel Institute, Waldorf-Astoria Hotel, New York, N. Y.

JUNE

5–7	Society of Automotive Engineers, National War Materiel Meeting, Book-Cadillac Hotel, Detroit, Mich.
6–8	American Society of Refrigerating Engineers, William Penn Hotel, Pittsburgh, Pa.
19–21	American Society of Agricultural Engineers, Annual Meeting, Schroeder Hotel, Milwaukee, Wis.
19–22	The American Society of Mechanical Engineers, Semi-Annual Meeting, William Penn Hotel, Pittsburgh, Pa.
21–22	National District Heating Association, Annual Meeting, William Penn Hotel, Pittsburgh, Pa.
22–25	Society for the Promotion of Engineering Education, Netherlands Plaza Hotel, Cincinnati, O.
26–30	American Institute of Electrical Engineers, Summer Technical Meeting, Jefferson Hotel, St. Louis, Mo.

For Calendar of coming A.S.M.E. Meetings see page 279 in the editorial section.

was established. Laclede-Christy is the oldest manufacturer of suspended flat arches in the business.

A new tunnel-kiln plant, one of the first of its kind in the refractories industry, was constructed in 1926.

In rounding out the Company's line of products to embrace almost every phase of the refractories business, still another forward step was taken in 1929 by the establishment of a Refractory Specialties Division. At present this line, consisting of high-temperature mortars, coatings, plastics, castables, furnace cement, and putties, over thirty items in number, is the most complete line of refractory specialties manufactured.

With the acquisition, in 1931, of the entire assets of the Buckeye Clay Pot Co. of Toledo, Ohio, Laclede-Christy became the world's largest producer of glass-house refractories for the glass industry.

Wide diversification is evidenced by the fact that the Company has developed six lines of products: general refractories, glass refractories, super-refractories, suspended flat arches and supported walls, vitrified products, and high-temperature refractory specialties. Laclede-Christy's many years of service in the refractory industry have been characterized throughout by an earnest effort to improve and advance the dependability and long life of its products.

The present officers of the Company are William P. Hemphill, President; A. H. Killinger, Vice-President; W. F. Godejohn, Vice-President; L. C. Hewitt, Vice-President; R. T. Risk, Secretary and Treasurer; and J. H. Schoemaker, Assistant Secretary abd Assistant Treasurer.

H. K. Porter Co., Inc., Enters Freight Car Industry

Pittsburgh, Pa.—Entering the freight car manufacturing field and greatly expanding its Process Equipment Division, H. K. Porter Co., Inc., Pittsburgh, Pa., has purchased Mt. Vernon Car Manufacturing Co. and its subsidiary, J. P. Devine Manufacturing Co., Inc., both with plants at Mt. Vernon, Ill.

Acquisition of Mt. Vernon Car Manufacturing Co., representing approximately 10% of the nation's freight car manufacturing capacity, makes Porter the largest independent in this industry.

J. P. Devine Manufacturing Co. is a maker of heavy chemical, food, and oil refinery equipment. With these facilities, the Porter Process Equipment Division becomes the largest manufacturer in the process field, with a complete line ranging from the smallest agitator to the largest fractionating column.

Recent reports of financial services give Mt. Vernon Car Manufacturing Co. assets in excess of $10,000,000. The new factories will add more than 90 acres of industrial property to Porter plants now located in Pittsburgh and Blairsville, Pa., and in Newark and New Brunswick, N. J.

T. M. Evans, president of Porter announced the purchase here today, marking the Company's fourth entry into new fields in recent years.

An active expansion program is planned for Mt. Vernon Car Manufacturing Co., Mr. Evans said, with new types, including a line of tank cars, being added to its present line of box cars, gondolas, refrigeration cars and cabooses. Development of tank cars for better transport of chemical products will be undertaken in cooperation with the Process Equipment Division.

Mr. Evans stated:

"Our Company has extensively investigated this field; and is of the opinion that

Continued on page 46

LUNKENHEIMER VALVES
whatever type.. mean better service

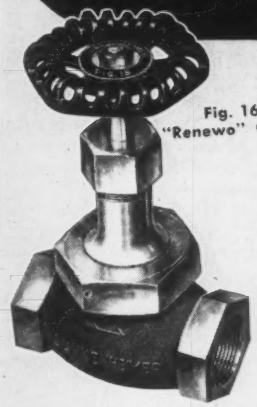


Fig. 16 "Renewo" Globe

Fig. 1640 "King-clip" Gate

Fig. 2125 Bronze Gate

In the heavy duty that Lunkenheimer Valves are doing on every front—industrial, maritime, army and navy, chemical, petroleum, synthetic rubber—a prime attribute is lasting quality . . . that inherent quality that comes of correct engineering, simplicity of design, and "know-how" manufacturing born of long experience.

These features in Lunkenheimer Valves are proving a boon to maintenance crews, in uninterrupted performance, low maintenance expense, and ease in making necessary repairs . . . in short, better service.

Let your Lunkenheimer distributor help you with your maintenance, repair and operating problems. His facilities and experience are at your call. Lunkenheimer Catalog 78 available on request.

ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI 14, OHIO. U. S. A.
NEW YORK 13 CHICAGO 6
BOSTON 10 PHILADELPHIA 7
EXPORT DEPT. 318-322 HUDSON ST., NEW YORK 13, N. Y.

SIMPLICITY OF DESIGN MEANS EASIER MAINTENANCE

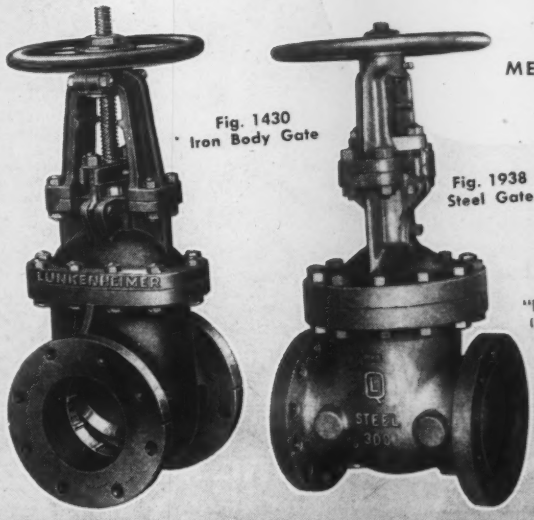


Fig. 1430 Iron Body Gate

Fig. 1938 Steel Gate

Fig. 123 "N-M-D" Globe (Non-Metallic Disc)

BRONZE, IRON, STEEL AND CORROSION RESISTANT ALLOY VALVES, 125 TO 2500 LB. S.P.; BOILER MOUNTINGS, LUBRICATING DEVICES, AIRCRAFT FITTINGS

the post-war freight car market contains a potential of 100,000 cars a year for the first five years after the war."

With an experienced staff and a third of a century background in the business, J. P. Devine Manufacturing Co. will add to the present Porter line such products as dryers, fractionating columns, impregnators, vulcanizers, flakers, condensers, besides facilities for manufacturing equipment already produced by Porter.

The Porter Company, since Mr. Evans came to the presidency in 1938, has added its Process Equipment Division to the original locomotive plant; built and is operating a naval ordnance plant at Blairsville, Pa.; and in 1943 purchased Quimby Pump Co., manufacturer of industrial and maritime pumps, with plants at Newark and New Brunswick, N. J.

Wickwire Spencer Steel Appoints Allington Sales Research Engineer

Dean Rollans, Vice President in charge of sales of the Wickwire Spencer Steel Co. announced today the appointment of H. C. Allington as Sales Research Engineer.

Mr. Allington will be in charge of the development and expansion of markets for the Company's products with particular emphasis in the oil and petroleum fields.

Mr. Allington, is well known in the petroleum marketing equipment business. Prior to joining Wickwire Spencer, he was district manager of the Logan-Allington Co., Inc. for twelve years. He has also been associated as district sales manager with the Sharpsville Boiler Works Co., Sharpsville, Pa., and sales manager of the Schlanger Divisions of American Machine and Metals, Inc. of New York and E. Moline, Illinois.

Mr. Allington will be located at the Company's executive offices, 500 Fifth Avenue, New York 18, New York.

William W. Small Joins Power Specialty Co.

William W. Small has recently joined the Power Specialty Co., 1536 Mellie Esperson Bldg., Houston, 2, Texas, as an Application and Service Engineer. Mr. Small is a graduate of Texas A & M College from which he received a Batchelor of Science Degree in Chemical Engineering.

At an early date, Mr. Small will be sent into the field to help with engineering applications and service on the products the company handles.

The Power Specialty Co. represents Cochrane Corp., Centrifix Corp., Erie City Iron Works, Foster Engineering Co., Hays Corp., Henszey Co., J. E. Lonergan Co., Lummus Co., R-S Products Corp., and Thomas C. Wilson, Inc.

Kropp Forge Names New Directors

Howard Hall of Cedar Rapids, Iowa, and James E. Sweeney became new directors of Kropp Forge Co. and Kropp Forge Aviation Co. at the annual meeting of these concerns last week. Mr. Hall is president of the Iowa Manufacturing Co. and Iowa Steel and Iron Co., and director of the Merchants National Bank, all of Cedar Rapids.

Mr. Sweeney who is works manager of Kropp Forge was also made a vice president. Raymond T. O'Keefe, Jr., director of industrial relations, was made a vice president of the Kropp Forge Aviation Co.

Officers reëlected include Roy A. Kropp, president; Raymond B. Kropp, first vice president and treasurer; and Charles Johnson, secretary. P. J. Healy and J. H. Lund were reelected vice presidents. Roy A. Kropp, Raymond B. Kropp and Charles Johnson were returned to the directorate.

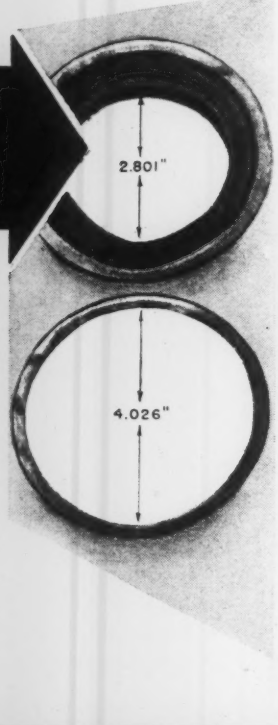
General Radio Co. Announces New Officers

At its recent annual meeting and directors' meeting held on the same day, a number of changes in personnel and the revision of duties pertinent to the several positions were made by the General Radio Co. of Cambridge, Mass., well-known instrument makers in the radio and allied fields.

Messrs. Eastham, Locke, Richmond and Shaw, long identified with the company, continue as directors, joined by Frank L. Tucker, formerly Comptroller, who was also elected Treasurer and Secretary. Melville Eastham, formerly President, and Henry S. Shaw, formerly Chairman of the Board, will hold no officership although the former will temporarily continue in charge of research and development with title of Chief Engineer. Harold B. Richmond was appointed Chairman of the Board and also Chairman of the Management Committee. Errol H. Locke, formerly Vice President, was elected President.

New appointments in addition to Mr. Tucker as Secretary and Treasurer, are Arthur E. Thiessen, formerly Commercial Engineer Manager, as Vice President in Charge of Sales, and Charles C. Carey,

Pipe clogged by scale to HALF its efficiency



HAERING GLUCOSATES
REMOVE THIS SCALE AND MAINTAIN FULL CAPACITY FLOW . .

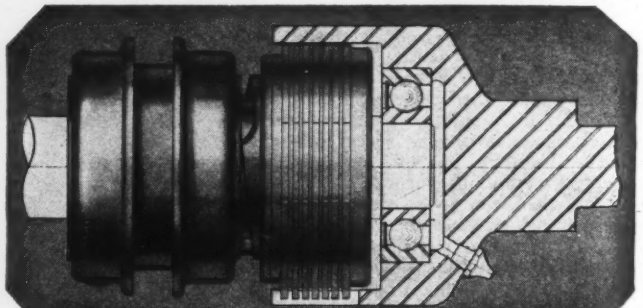
Scaled Pipes Cost Money
Scale Prevention pays Dividends

We will send you any of our technical publications.

Better yet, a Haering Field Engineer will survey your plant and submit the story and answer in writing.

WE READ WATER
D. W. HAERING & CO., Inc.
GENERAL OFFICES:
205 West Wacker Drive
Chicago 6, Illinois.

How PULLMORE CLUTCHES Help Eliminate Plain Bearing Drag

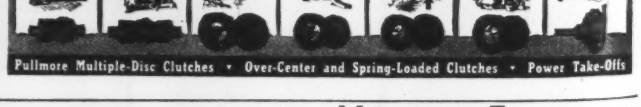


This single type, dry PULLMORE Multiple Disc CLUTCH application has a grease-seal ball bearing—which eliminates the drag that is present when a plain bearing is used. The PULLMORE Multiple Disc CLUTCH has several exclusive advantages that improve the performance of machines in which they are used. Let our engineers suggest how PULLMORE CLUTCHES will help you get the jump on competition.

Send for These Power Transmission Bulletins

They give capacities, dimensions and specifications. Contain application diagrams. Show how PULLMORE exclusive features are being used to help give post-war products competitive advantages.

Rockford Drilling Machine Division Borg-Warner Corporation
1307 Eighteenth Ave., Rockford, Illinois, U. S. A.
Pullmore Clutches are sold by Morse Chain Co. offices in principal cities.



• Keep Informed

formerly Superintendent, as Vice President Charge of Manufacturing. The directors, with the addition of Messrs. Carey, Thiessen and Charles T. Burke who is Engineering Manager, comprise the Management Committee.

C. E. Hills, Jr., Commercial Manager, who has been associated with the company since 1922, will continue in that position but in addition has been appointed Assistant Secretary and Assistant Treasurer of the company.

S. E. Lauer Named to War Labor Board

York, Pa.—S. E. Lauer, President of the York Corp. here, has been appointed a member of the Philadelphia Regional War Labor Board, Region III, as a representative of industry.

Mr. Lauer's appointment was officially approved by William H. Davis, Chairman of the National War Labor Board in Washington, D. C.

Philadelphia Gear Works Announces Organization Changes

The following organization changes are announced effective January 1, 1944. James N. Morrell became Sales Manager Limitorque Valve Control Division of Philadelphia Gear Works, Phila., Pa. Thomas V. Withington relinquished his position as Chief Engineer to become Assistant Sales Manager —Limitorque Division. William F. Plume succeeded Mr. Withington as Chief Engineer. Robert E. Richards is appointed Assistant Chief Engineer. All have been assosiated with the company for some time.

• LATEST CATALOGS

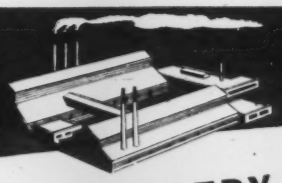
Unit Heaters

Three new additions to A.I.A. file on unit heaters, as follows:

1. "Carrier 46S Unit Heaters Insure Wide Heating Coverage and Flexibility," two-page sheet, 46S-6, for A.I.A. File No. 30-C-43, points out that this unit also saves critical materials, since it uses $^1/_{15}$ the basic materials required for direct radiation. Equipped with vertical discharge propeller fan, this Unit Heater discharges out heat from four sides and downward as well. Many, individually-controlled air streams from adjustable louvres, permit varying direction, distance, and velocity of warm-air distribution, accomplishing greater heating coverage than heretofore. Sheet also has chart dimensions, steam ratings, and BTU constants.

2. "Economical Heating for Industrial Buildings," A.I.A. File No. 30-C-43, two-page sheet, 46E-22, describes Carrier Type 46E Unit Heater with propeller fan for horizontal discharge. Unit saves critical materials (about $^1/_{15}$ the basic materials used in direct radiation). Unit's coils are of Aerofin, continuous U-bend tubing, which relieves the hazards of expansion and contraction and the leaks resulting therefrom. Its steel coils, cast malleable headers, and silver-brazed joints are factory-tested for 1,000 lbs. hydrostatic pressure, 125 lbs. steam, and 400 lbs. air pressure under water; are also guaranteed for operation on saturated steam working pressure up to 200 lbs. Steel coils are coated with a lead alloy to insure proper heat transfer and protection against corrosion. Sheet also shows charts of (1) dimensions of various sizes of this unit, (2) steam ratings, and (3) BTU constants.

Continued on page 48



AMERICAN INDUSTRY SAVES

$750,000,000

per year by using

KENNAMETAL

PRODUCTS AND ENGINEERING

KENNAMETAL PRODUCTS

CUTTING TOOLS

Kennametal-tipped single-point tools are used in America's leading machine shops for turning, facing, and boring steel up to 550 Brinell hardness, cast iron, and the softer metals.

MILLING CUTTERS

Kennametal-tipped cutters have revolutionized milling practices by making possible the milling of all metals, including the toughest steels, at almost incredible speed.

WEAR RESISTING PARTS

Kennametal inserts are used to prolong precision machine performance by protecting the "wear-areas" against effects of friction, corrosion and erosion.

The carefully recorded experience of one of our customers for the year 1942 indicated that actual savings resulting from the use of Kennametal-tipped machining tools totaled $50,000. Projected to a national basis for the same year, American Industry saved approximately $750,000,000 through the use of Kennametal. In 1943, the widely extended application of Kennametal increased these savings correspondingly.

These are dollars-and-cents figures—figures in which industry is normally interested. But as American citizens, we are today even more interested in how the savings will help win the war—man-hours saved and production gained are the vitally important factors. Every faster cutting operation in your shop means faster cutting of the deep, straight paths of destruction that lead to Berlin and Tokyo. Shortening the job means shortening the war. Shortening the war means saving lives.

You can shorten machining time, and cut costs, by using Kennametal-tipped tools. Kennametal, a cemented carbide composition, contains a unique intermetallic compound (tungsten-titanium-carbide) that is unsurpassed, except for the diamond, in hardness. Our district field engineer can tell you how to use it for maximum metal-cutting results. Kennametal Catalog 43-C contains useful information on tool design, use, and maintenance. Write for it.

KENNAMETAL Inc.

367 LLOYD AVE., LATROBE, PA.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

Trade Mark Reg. U.S. Pat. Off.

3. "Carrier Blower-Type Heat Diffusers," four-page folder, 46PQR-17, for A.I.A. File No. 30-C-45, describes advantages of four models of these diffusers in heating and ventilating large areas. Main features: wide, uniform heating coverage due to relatively high velocities; selective air distribution, from units having two or three fans and plain or louvred outlets; adaptability to specifications, since there are models suitable to all building sizes and shapes; and versatility in application, units being equally satisfactory for heating, ventilating, and drying. Folder also includes charts of BTU constants, steam ratings, and dimension drawings of horizontal suspended units, vertical suspended units, and floor-mounted units.

Copies of all three publications may be obtained by writing News Bureau, Carrier Corp., Syracuse 1, N. Y.

Fractional Horsepower Texrope V-Belts and Sheaves

A new 44-page bulletin describing its complete line of Fractional Horsepower Texrope V-Belts and Sheaves has been released by Allis-Chalmers, Milwaukee, Wis.

Bulletin B6249 offers simplified engineering data for fractional horsepower drives. Horsepower ratings are based on driven revolutions per minute and on belt velocity. Also included in the new book are working formulas from which correctly-engineered fractional horsepower drives can easily be derived.

Amply illustrated with installation photographs, line drawings and selection tables, the bulletin will be of interest to manufacturers and operators of light duty power tools, fans, blowers, pumps, stokers, oil burners, processing equipment, numerous appliances.

For complete fractional horsepower drive information, send for Bulletin B6249. Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

New Duragauge Bulletin

Ashcroft announces a new 12-page bulletin on the phenol turret case Duragauge.

It illustrates in colors the assembly of the gauge, full explanation in text and illustration is given of the rotary movement, the design and construction of the system, general dimensional drawings, illustrations of all thirty-one dials available.

A copy of this new Duragauge Bulletin may be had by writing to the manufacturers, Manning, Maxwell & Moore, Inc., Bridgeport, 2, Connecticut.

Hydraulic Torque Convertors

Facts concerning the function, operation and installation of "Hydraulic Torque Converters" are concisely presented in a 16-page booklet so entitled and just published by the Twin Disc Clutch Co., Racine, Wisc., and Rockford, Ill.

This material will help machine designers, manufacturers and users to gain a clearer understanding of the capabilities of this modern method of gaining mechanical advantage between driving and driven units. A discussion of the Hydraulic Torque Converter's purpose is followed by a clear, simple explanation of how the device operates. Great care has been exercised to point out the various factors which should be considered when the use of these power links is contemplated.

Several models of the Twin Disc Hydraulic Torque Converter are described in detail with the aid of photographs and drawings. Sufficient installation data is included to make this booklet a valuable aid in the planning of initial layouts and in drawing up preliminary specifications for equipment on which torque converters are to be used.

As a contribution to the limited supply of published literature on the subject, "Hydraulic Torque Converters" is a booklet worth having. Designed as Bulletin No. 135, the booklet may be had on request to the Twin Disc Clutch Co., Hydraulic Division, Rockford, Ill.

Bucket Shipments by Air Indicated in New Hayward Bucket Guide

In a new 16-page vest-pocket guide on its complete line of digging and rehandling buckets, The Hayward Co., 50 Church Street, New York, N. Y., announces that it is preparing to make quick shipments of Hayward Buckets by air just as soon as cargo planes are available for carrying civilian freight. This illustrated factual publication is designed for the busy operating man who wants a quick picture of the improved types of buckets now available, the uses for which each is recommended, the capacities and sizes obtainable. Information and data are given on Rehandling and Digging Clam Shell Buckets, Electric Motor Buckets, Standard and Multi-power Orange Peel Buckets, Sewer Catch Basin Buckets, Automatic Take-up Reels and Grapples for a wide variety of materials such as tiered wood, manure, rocks, tree trunks and pulp wood.

Copies are available by sending a request to the manufacturer.

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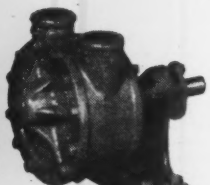

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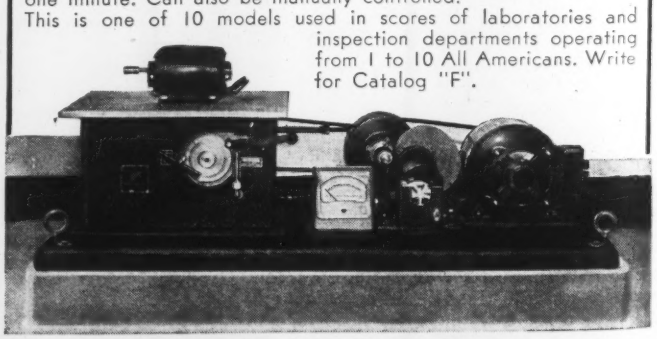

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Catalogs, Data Booklets, Instruction Manuals, Information Folders, Etc.—offered by current advertisers in A.S.M.E. Publications—an aid to those on the War Production Front—to save precious, fleeting time—and for Post War Planning. You'll find something here listed of interest to you in your present work to get high productivity, speed and accuracy—equipment that helps to multiply man-hours.

FOR convenience in locating catalogs about a particular piece of equipment, product or service, a list is given below in which the numbers refer to the catalog items beginning on page 32. This will aid you in locating something specific although a perusal of the entire list may disclose something of more than usual interest or something that you may have been looking for.

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THIS semi-annual insertion of CATALOG BRIEFS replaces the regular "Keep Informed" Section for this issue due to the paper situation. The "Keep Informed" Section will appear regularly again beginning with the next issue.

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With both molybdenum and tungsten again available for use in high speed steel, consideration of their comparative performance is timely.

Before the war, a careful recording of comparative tests converted many users and tool makers to molybdenum high speed steel. During the tungsten shortage, when use of a high percentage of molybdenum types became mandatory, most users could not watch the performance of their tools carefully enough to draw conclusions on their respective merits.

Reports from large tool producers and users confirm that molybdenum high speed steels, when properly heat treated, perform at least as well under different kinds of shop conditions as the tungsten types which they replace.

Given equal performance on any particular type of work, an investigation of the saving in machining cost effected by molybdenum steels will prove well worth while.

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RCA Victor Div., Radio Corp. of Amer.—A clear-cut exposition of the practical part electronics are playing in various industrial fields is graphically presented in a 44-page Booklet released by the Radio Corporation of America, entitled "Electronics in Industry." Profusely illustrated in color and written in non-technical language, this booklet shows RCA devices improving products, and saving time, space, manpower and costs.

2 WELDING FITTINGS

Tube Turns, Inc.—Catalog and Data Book, No. 111, made up of the following divisions: engineering, welded fittings, flanges, and technical. Each division is complete with full information, illustrations, charts, and installation data on the subjects covered. It is a 240-page book completely indexed for quick reference.

3 MATERIALS HANDLING MACHINERY

Robins Conveyors, Inc.—6-page Bulletin No. 125, describes and illustrates Conveyors, Screens, Bridges, Towers and other units for handling heavy, bulk materials quickly and economically. List of materials and methods of handling are told in detail. Available in English, Spanish, French, Russian and Portuguese.

4 STEEL VALVES

Edward Valve & Mfg. Co.—Featuring complete drawings, sectional views and dimensional tables, Edward Better Valves Catalog No. 102 contains a comprehensive selection of cast and forged steel valves with basic ratings of from 150 to 1500 lb. for temperatures to 800° F, or for 6000 lb. hydraulic service. Included are globe and angle stop, check, Intex, relief, non-return, blow-off valves and other Edward steel specialties.

5 DIESEL ENGINE OIL

Ohio Grease Co.—An attractive 6-page Folder entitled "Diesel Engine Oil" described in some detail, shows laboratory tests and gives selling prices in various quantities on Ohio Lubricream "D" which the manufacturers class as "The Cream of Diesel Lubricants."

6 VIBRATION FATIGUE TESTING

All American Tool & Mfg. Co.—The need for "shakedown" tests of post-war products as well as those of today is discussed in new Bulletin 210 which shows the entire line of All American Vibration Fatigue Testing Machines with special emphasis on the Model 10VA, a new model for plants making parts or assemblies up to 10 lbs. each in weight. Explains the automatic cycling feature which continuously changes the frequency from 10 c.p.s. to 55 c.p.s. (600 to 3,300 vibrations per minute) and back, the complete cycle requiring one minute.

7 STEAM GENERATING PLANTS

Cleaver-Brooks Co.—New Catalog fully describing their "Oilbilt" Steam Generating Plant together with a cardboard slide rule for determining steam costs for various types of both oil and solid fuel fired steam generating systems. Catalog gives dimensional data, complete specifications, including cutaway view of all 17 "Oilbilt" sizes which are available in working pressures up to 200 lbs. per sq. in.

8 DRAFTING MATERIALS

Frederick Post Co.—Products all so necessary to the speed in today's drafting room production will be found in the new Post 18th Edition Catalog. "Vapopaper" for better ammonia dry-developed direct process positive prints—"Penciltex" and "Whitex," both pencil tracing cloths that produce ink-like results at pencil speed—P.T.M., a super-transparent treated pencil tracing medium at considerable savings—and "Masterrepro," the sensitized tracing cloth that produces duplicate tracings quickly. In addition will be found a complete line of drafting materials such as T-squares, triangles, instruments, drawing paper, etc., also a complete line of tracing papers and cloths, blue-printing paper and cloth positive printing paper and cloth and drafting room furniture.

9 INFRA-RED RADIANT ENERGY

Gifford-Wood Co.—New Bulletin No. 150 illustrates application of Infra-red Radiant Energy for the drying and baking of industrial finishes. Illustrations in this bulletin show the various steps required for product handling and sequence of operations. Listed are the advantages of using Radiant Energy as an agent for increasing production and for obtaining better protective finishes.

10 THERMOMETERS

Palmer Co.—"Red-Reading-Mercury" Industrial and Laboratory Thermometers and "Superior" Dial and Recording Thermometers. 1942 edition of their Catalog No. 200-F and 300-D.

11 MACHINE TOOL CLUTCHES

Twin Disc Clutch Co.—Machine tool clutches are the subject of an interesting and informative Bulletin No. 134. The MTU and MTS clutches described were primarily designed to meet special requirements of machine tool installations. Specifications are completely presented and illustrations of construction details demonstrate how ease of operation and single point adjustment have been added to the usual requirements for machine tool clutches.

12 FOUNDRY POURING AND HANDLING EQUIPMENT

Industrial Equipment Co.—Catalog describing and illustrating Bowls, Shanks, Tongs, Bails, Trolley Ladles, Buggy Ladles, Geared Ladles of the Crane—Buggy—Interchangeable Crane and Buggy, and Reservoir Type, Insulated Ladles, Mixing Ladles and Bottom Discharge Ladles.

13 METAL LAYOUT INK

Louis Melind Co.—Bulletin covering a new product—Justrite Tool and Diemakers Metal Layout Ink. It is easily spread onto the die, template or machine part and dries instantly, forming a beautiful, gloss-free plum-purple color into which the design can be scratched with a scriber. Will not crack or peel off. Will not wash away. Also for checking gear tooth contact, and in pointing out high spots, and is an aid in perfect registry of mating surfaces.

14 CHAINS, MATERIAL HANDLING AND REDUCTION EQUIPMENT

Jeffrey Manufacturing Co.—Booklet No. 733, entitled "What We Make" gives a quick picture of the broad Jeffrey line of chains, material handling and reduction equipment. Many products illustrated.

15 HEAT INSULATION

Union Asbestos & Rubber Co.—Catalog of insulation methods contains diagrammatic sketches, photographs and graphs giving necessary application information along with information regarding heat loss and surface temperatures. It contains practical, economical methods of insulating boilers, induced draft fans and ducts; turbine and stop valves; valves, flanges and fittings, etc. An additional valuable piece of data offered by this catalog is a table of thickness to use—indicating thicknesses and heat loss of these thicknesses for maximum, economical efficiency.

16 EXHAUST AND VENTILATING FANS

Aerovent Fan Co.—The Aerovent "Macheta" Airfoil 10th Edition Catalog is descriptive of their entire line of exhausts and ventilating fans, including the direct connected type, mancooler belted, extended shaft, duct and pulley driven type. All ratings are certified in accordance with the Standard Test Code as adopted by the Propeller Fan Manufacturers Association.

17 PIPE FITTINGS FOR WELDING

Taylor Forge & Pipe Works—New Catalog on the company's line of seamless steel pipe fittings for welding and forged steel flanges. Includes within its 216 pages much technical data not readily available elsewhere. Complete data is presented

If you use—symbols, signs for equations, formulas, and abbreviations . . . you need these STANDARDS

LETTER SYMBOLS FOR HEAT AND THERMODYNAMICS, INCLUDING HEAT FLOW Z 10.4—1943 55¢

250 Letter Symbols consisting of symbols common to other fields of science and engineering, for heat and thermodynamics, for heat flow, and for radiation.

LETTER SYMBOLS FOR MECHANICS OF SOLID BODIES Z 10.3—1942 25¢

These eighty-odd letter symbols are for concepts of mechanics of solid bodies.

LETTER SYMBOLS FOR HYDRAULICS Z 10.2—1942 35¢

In addition to the general symbols, there are approximately a hundred special symbols for hydraulic structures, for hydraulic machinery, and for hydraulic models.

ABBREVIATIONS FOR SCIENTIFIC AND ENGINEERING TERMS Z 10.1—1941 35¢

Outlines rules to be observed when using abbreviations and lists 277 letter symbols.

ENGINEERING AND SCIENTIFIC GRAPHS FOR PUBLICATIONS Z 15.3—1943 75¢

While recommendations apply chiefly to line graphs that show relationship between two variables in rectangular coordinates, many of the principles given here are applicable to other types of graphs and co-ordinate systems. Shows how to design graphs; select material; use curves, plotted points and their designation; construct original graphs to be used for reproduction, and handle finished illustrations.

GRAPHICAL SYMBOLS FOR USE ON DRAWINGS IN MECHANICAL ENGINEERING Z 32.2—1941 50¢

The 300 symbols in this collection are for plumbing, piping, pipe fittings and valves, heating and ventilating, heat power apparatus, conventional rivets, air conditioning, sprinklers, pneumatic tubes, ductwork, refrigeration, gas-, arc- and resistance welding.

DRAWINGS AND DRAFTING ROOM PRACTICE Z 14.1—1935 50¢

These recommendations include arrangement of line work, dimensioning, sheet sizes, symbols for outside view, and lettering for engineering drawing.

ENGINEERING AND SCIENTIFIC CHARTS FOR LANTERN SLIDES Z 15.1—1932 50¢

A valuable set of rules for drawing the original charts and for their reproduction as lantern slides. Specifies types and sizes of lettering, different line widths, and sizes of symbols commonly used in graphs. An appendix contains a table of commercial lettering templates and lettering pens with which charts may be easily reproduced in the manner recommended.

TIME SERIES CHARTS Z 15.2—1938 $1.25

This detailed study embraces size, proportions, positions, margins, and composition of Line, Column, Surface, and Rate-of-Change charts; dimensions of grids, frequency and weight of horizontal and vertical rulings, scale selection and designation; curve and chart designations. A glossary of terms is included.

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18 MECHANICAL DRAFT EQUIPMENT

American Blower Corp.—Bulletin No. 3624, which describes their power apparatus equipment, namely, Forced and Induced Draft Fans, all types of Dust Collectors, and the Hydraulic Coupling. The catalog also illustrates preferred Mechanical Draft arrangements.

19 RHEOSTATS, RESISTORS, CHOKES, TAP SWITCHES, ATTENUATORS

Ohmite Mfg. Co—Complete, helpful 96-page Catalog and Engineering Manual No. 40. Valuable guide on resistance problems. Explains how to select the proper Rheostats, Resistors, Tap Switches Chokes and Attenuators. Contains useful engineering data, reference tables, dimension drawings, illustrations, and a manual of resistance measurements—all clearly defined and arranged to make it easy to select stock items or to plan special units for military, industrial and electronic applications.

20 ROLLING DOORS

Kinnear Manufacturing Co.—A 40-page Catalog describing the complete line of Kinnear rolling doors, rolling grilles, fire doors and shutters, bi-folding doors, wood rolling partitions and door operating equipment and accessories. The catalog is attractively printed and illustrated with numerous photographs and drawings of door installations. Complete specifications, construction details and methods of installing the various types of doors are provided or explained.

21 FLEXIBLE SHAFTING

F. W. Stewart Mfg. Corp.—20-page Booklet with over 200 illustrations showing the many uses for Flexible Shafting. Describes not only the application of flexible shafts to war material such as airplanes, tanks, aircorps equipment, etc., but also the broader use for industrial plants. Graphic display of various shaft end fittings and flexible casting.

22 AIRCRAFT RELAYS AND CONTROLS

Guardian Electric Mfg. Co.—16 pages of catalog information on operating characteristics, dimensional drawings, wiring diagrams and general construction information on aircraft relays, contactors, solenoids, and aircraft accessories. Shows 3 variations of the versatile B-2A relay built to A.A.F. specifications. Also various other aircraft relays including a time delay and an interlocking relay; 9 new lightweight solenoid contactors (A.A.F. types B-4, B-5B, B-6B, B-7B, B8 and N.A.F. types 1204-1, 1204-2, 1204-3); eight solenoids; 6 types of gun switch handles; and a control wheel for double engine pursuit planes.

23 STAYBOLTS

Flannery Bolt Co.—Complete Catalog, 76 pages, describing their line of Staybolts and Staybolt Parts for boilers. It explains and illustrates the various types of assemblages used in staybolt installations in boilers, including flexible, rigid and hollow staybolts. The different types of staybolts heads are discussed, covering round headed, also taper and button headed in straight body and reduced body types; also different types of sleeves, including welded and threaded as well as the different types of caps or closures for the sleeves described. Other small parts are discussed and described. Installation Tools are described and illustrated.

24 PHOTOCOPY EQUIPMENT

American Photocopy Equipment Co.—A-PE-CO Photo-Copy equipment and supplies and their many uses are outlined in a 4-page folder. The ability of A-PE-CO to make photo-copies direct from blueprints, appeals to engineers, together with the ability of A-PE-CO to photo-copy anything written, printed, drawn or photographed in such exact detail that A-PE-CO photo-copies are accepted as legal evidence. Accuracy, ease in using, speed and versatility are the advantages of A-PE-CO most general in appeal.

25 TURBINE PROCESS PUMPS

Dayton-Dowd Co.—Bulletin 3300. A descriptive Bulletin incorporating detailed information regarding a new pump for process work in refineries, synthetic rubber plants, ordnance plants, etc. Typical performance curve, sectional view, and general dimensions of various sizes with motors are included.

26 RING CRUSHERS

American Pulverizer Co.—New Bulletin, illustrating and describing its "AC" type rolling ring crushers for reducing bauxite, coal, rock salt and other similar materials. This bulletin is well illustrated and gives information on weights, sizes, capacities, floor space requirements, etc.

27 DUST CONTROL

American Air Filter Co.—AAF In Industry, Bulletin # 502, contains interesting information about dust, dust problems and their solution by modern dust control methods. Illustrated with many photographs, drawings, charts, covering the application of American Air Filters and Roto-Clone Dust Precipitators to industrial dust problems.

28 STOKERS

Canton Stoker Co.—5-Bulletin Portfolio showing ranges of application of Canton heavy-duty standard and low-set ram underfeed stokers as well as extra heavy worm feed stokers; users list by name, location, model, h.p., number of units, and industry. Well illustrated. Gives quick preview of application engineering information. See our advertisement pages 72-73, A.S.M.E. Mechanical Catalog and Directory.

29 FUSION WELDING CAST IRON

Linde Air Products Co.—In a series of practical exercises this 12-page Booklet explains in detail the technique of welding cast iron with cast iron rod. Also included are identification of types of

Continued on page 34

IF "PREPARING FOR PEACE"
★ includes Pumps ★
SEE GOULDS NOW

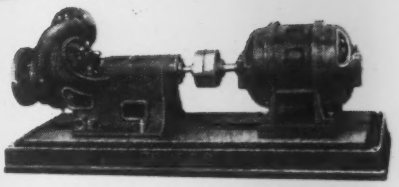


Fig. 3380 2 stage opposed impeller type centrifugal.

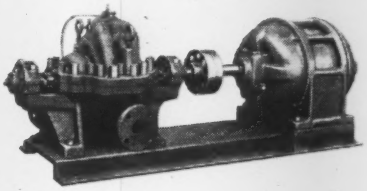


Fig. 3720 Single stage enclosed impeller direct connected centrifugal

Many users of pumps bring their entire liquid handling problem to Goulds. They know that from Goulds they get unbiased recommendations for *the pump for the job.* And usually they can get that pump from Goulds whether the one best suited is reciprocating, rotary or centrifugal, whether 5 g.p.m. or 16,000 g.p.m., because Goulds makes them all.

If you are "preparing for peace" and your plans include pumps, we are ready now to discuss those plans with you and share with you what we have learned about better and more efficient ways to solve pump problems.

If your products or services are directly connected with the war effort, Goulds Pumps are *available now* on priority. A statement of your highest available priority will enable us to quote best possible delivery.

Goulds
PUMPS INC.
SENECA FALLS, N. Y.

How to Keep Steel Mill Ladle Hooks *in Service*

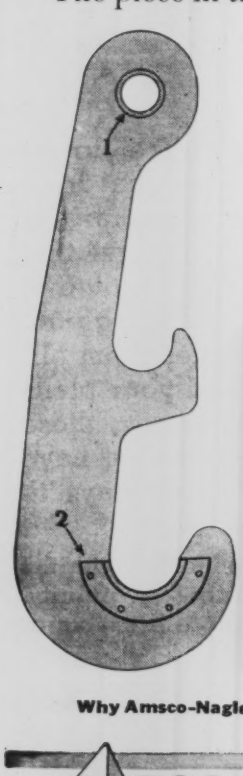
Of the numerous gadgets we make in manganese steel, bushings are the most common. Ordinarily, of course, a bushing is a hollow cylindrical piece fitted into a hole in a working part to take the wear and to be replaced as necessary, thus extending the life indefinitely of the larger piece, and saving a lot of money. That is the function of the bushing (1) shown on the right of our photo R-778—it fits into the top hole of the ladle hook in our sketch. The hook is 9 feet long and it might have to be replaced if the chain hole enlarged to the danger point from wear.

The piece in the foreground (2) is a half-bushing used on the same ladle hook, but in the "bight" of the lower end that picks up the ladle bail and must withstand the whole weight and friction of the tremendous load. Two half-bushings are used to a hook, the flanges being riveted to each side and the two "barrels" meeting above.

Manganese steel is used in such applications because it resists fracture under heavy stress and because the surface work-hardens under pressure and friction to an extent not equalled by any other steel.

Frankly, bushings are more important to the user than they are to us as a source of profit, but their performance illustrates perfectly the economy of "the toughest steel known."

Ask for Bulletin 543-G, "Manganese Steel for General Industry" or 1142-SM covering the steel industry.



Use of manganese steel bushings, as shown, increases the service life of these ladle hooks.

Why Amsco-Nagle centrifugal pumps render long service, told in Bulletin 940.

Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois

AMERICAN Brake Shoe COMPANY

FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

CATALOG BRIEFS

cast iron, welding characteristics, heat treatment, inspection of welds, and instructions for building a preheating furnace.

30 BALL BEARINGS

Aetna Ball Bearing Mfg. Co.—32-page Engineering Catalog, besides listing the entire Aetna line of Thrust Ball Bearings and kindred parts, contains a valuable directory of bearing information—useful calculations and formulae, important application principles, fundamentals of proper lubrication and other practical authoritative information, contributive to better, more economical ball bearing performance. In addition to its standard, cataloged bearings, the Aetna plant is equipped to produce special thrust ball bearings up to 38" O.D.

31 DRY DIRECT PROCESS PRINTS

C. F. Pease Co.—Descriptive literature on Pease "700" "Multazo" Dry Direct Process Developing Machine. Another addition to the universally accepted Pease Line of streamlined tracing reproduction machines—a table model dry direct process developing machine with a speed of 8 ft. per minute, for use with any blueprinting or direct process printing machine. Pease "700" is easy to operate and economical.

32 FEED WATER REGULATION

Northern Equipment Co.—Booklet entitled "Mechanical Feed Water Regulation for Boilers" by Professor E. P. Culver. This is the Sixth and revised edition of a treatise on the fundamental principles of scientific boiler feed water regulation. It is well illustrated with diagrams, charts, and photographs. Recommended for engineers, plant operators, and engineering students.

33 BALL AND ROLLER BEARINGS

Gwilliam Co.—Latest Catalog describes complete line of Ball and Roller Bearings and contains illustrations of various types with lists of standard sizes. A stock of a large number of standard and special sizes in all the various types is maintained for prompt shipment. Special bearings differing in design and size from their standards are constantly being developed to meet customers' specifications. Duplicating original bearings that have become worn or broken in service is a highly specialized branch of their business.

34 FURNACE WALLS

American Arch Co.—Pamphlet #711, 8 pages on the American Type "G" Lock Tile Wall gives descriptive and dimensional data on this simplified design of sectionally supported wall which is adaptable to boilers and industrial furnaces. Various applications of the type "G" wall are also shown.

35 INSULATION TESTERS

James G. Biddle Co.—Pocket Manual of "Megger" Practice, No. 1420. This publication has been popular for many years and is used extensively by engineers and electricians having electrical equipment to maintain and to keep in constant running order. The book contains material not readily found elsewhere on insulation and in particular the phenomenon of insulation resistance, which the "Megger" instruments are designed to test. The book also includes full illustrations for operating and using various types of the "Megger" Insulation Testers.

36 VALVES, BOILER MOUNTINGS, ETC.

Lunkenheimer Co.—Lunkenheimer Catalog 78 includes a comprehensive representation of Bronze, Iron and Steel Valves, Boiler Mountings, Lubricating Devices, Air Devices and numerous other specialties. In addition to the technical and dimensional data relating directly to the products, there is a section on the thermodynamic properties of steam, and a table of shipping weights covering each figure number listed in the catalog.

37 AUTOMATIC REFRIGERANT GAS PURGERS

Armstrong Machine Works—8-page technical Bulletin on automatic gas purgers for refrigerating systems. This bulletin contains data on the cost of operating with excessive condensing pressures and data for determining whether condensing pressures are excessive. Bulletin also contains complete data on the installation and operation of automatic purgers.

38 AIR RELIEF VALVES

Kunkle Valve Co.—Latest Bulletin describing the new figures 28 (A.S.M.E. Std.) and 29 (A.S.M.E. & Mass. Std.) which are the ideal valves for use on Air Compressors, Pressure Tanks, and Gas Lines, made solely of high quality brass with either a composition or a Metal seat, guaranteed bottle tight to within 10% of popping pressure. Pressure

not to exceed 300 pounds, supplied with male Standard Pipe connections, made in the following sizes, 1/4", 3/8" and 1/2".

39 DRAFTING ROOM FURNITURE

Hamilton Manufacturing Co.—Hamilton Drafting Furniture . . . Streamlined for War described in New Liberty Line Catalog. Autoshift Tables with instant adjustment for height and slant from horizontal to vertical . . . Tracing Files, with patented tracing lifter, making every sheet a top sheet . . . and a complete line of files and drawing tables to meet all requirements.

40 BALL, ROLLER AND NEEDLE BEARINGS

Bantam Bearings Div., The Torrington Co.—"The Bearing Engineer"—Technical house organ edited primarily for product designers and engineers concerned with problems relating to selection, application, installation of anti-friction bearings of all types. Published bi-monthly.

41 FLEXIBLE COUPLINGS

Poole Foundry & Machine Co.—Flexible Coupling Handbook. Describes and illustrates Poole Flexible Couplings and embodies data, tables and other engineering information—a valuable reference book to all users of flexible couplings and to engineers specifying such equipment.

42 INSTRUMENTS AND CONTROLS

Leeds & Northrup Co.—A well-arranged, 6-page Folder (N-160) condenses much useful information regarding instruments and controls for steam, hydro, diesel and electrical power generation and distribution plants. Concisely describing measurements and controls for temperature, flow, gas analysis, smoke density, condensate purity, combustion, frequency and load, the broadside should be useful to engineers seeking to meet wartime load conditions. Includes copious footnote references to many more complete catalogs.

43 CENTRIFUGAL BLOWERS AND EXHAUSTERS

Roots-Connersville Blower Corp.—Bound Bulletin Sets in lieu of catalog. This permits additions from time to time which keep material current. Some recent additions include Bulletin 120-B12 on Centrifugal Blowers and Exhausters; Bulletin 100-B14 on Inert Gas Generators, and Bulletin 31-B15 on Victor-Acme Gas Pumps. Other new bulletins will be available shortly regarding Rotary Positive Blowers, Exhausters, Vacuum and Liquid Pumps, and Meters, as well as Centrifugal Blowers and Exhausters and Inert Gas Generators already mentioned.

44 STOKERS

Hoffman Combustion Engineering Co.—Bulletin fully describing the Hoffman "Firite" Spreader Type Stoker for any type of boiler. Construction and operating features are given. Illustrated.

45 WELDING, BRAZING AND SOLDERING FLUXES

Krembs & Co.—Engineering Bulletin describing 89 different fluxes, each for specific types of welding, brazing or silver soldering jobs. Bulletin explains how to select the proper flux for each. Published by a group of consulting, welding and brazing engineers.

46 ASH CONVEYOR SYSTEMS

United Conveyor Corp.—Pneumatic Ash Conveyor Systems applicable to medium and large size power plants are described in the "Nuveyor" Ash Conveyor Catalog. The "Nuveyor" Pneumatic Conveyor is especially applicable for dust and ash handling for pulverized coal furnaces as well as for stokers. Many hundreds of industrial plants and public utilities are served by the "Nuveyor."

47 FLUID POWER TRANSMISSIONS

Oilgear Co.—Radial Rolling Pistons, Constant Torque, Variable Speed Transmissions using high grade oil as a fluid power medium; two to 20 h.p.; one or two-way types; Hand Wheel, Worm Wheel, Electric Pilot Motor, Hydraulic Servo-Motor, Hydraulic Two-speed, Electric three-position and other controls. Bulletin 60000 describes construction and principle of operation and gives specifications, dimensions and practical applications. Small, high-speed, custom built transmissions to best suit special requirements.

48 ELECTRIC MOTORS

Allis-Chalmers Mfg. Co.—New Handbook on Care of Motors. With motors operating 168 hours a week instead of 40 hours as formerly, most books on motor care are now seriously out-of-date. To correct this situation, Allis-Chalmers has just published a new handbook entitled "A Guide to Wartime Care of Electric Motors." Taking a fresh, new slant at the subject of motor care under war conditions, the book is of great value to war plant engineers and maintenance men, and is of particular value for training new men. The book contains no advertising, and is available upon request.

49 ELECTRIC HOISTS

American Engineering Co.—"Lo-Hed" Electric Hoists offered in capacities from 1,000 to 24,000 pounds. Bolt suspension, plain trolley, hand geared trolley, and motor driven trolley. Various speeds, lifts, and electric controls. Balanced design permits low headroom, a desirable plus feature, at no additional premium. Catalog H-40-A gives full information.

50 DRYERS, DEHYDRATORS

Link-Belt Co.—24-page copiously illustrated Book No.1911 covers the Link-Belt Roto-Louvre Dryer for fast, gentle, uniform mass-drying or dehydration of a great variety of materials, coal, ore, sand, chemicals, meat, foodstuffs, etc. Also used as a cooler. Occupies minimum space. Line drawings and text explain reason for high efficiency. Available in various sizes to suit capacity needed.

51 DUST CONTROL

Kirk & Blum Mfg. Co.—An interesting and informative group of Booklets, issued by this firm with a background of more than 36 years of practical experience in dust and fume control, as well as glass cooling systems and the fabrication of sheet metal parts, has made installations in many of the leading industries throughout the country. The following is a list of the booklets: "Dust Control Systems in Metal Industries", "Fan Systems for Various Industries", "Blower Systems for Woodworking Plants", "Industrial Ovens", "Cooling Systems for the Glass Industry", and "Data on Kirk & Blum Production Facilities."

52 VACUUM PUMPS

Leiman Bros.—Bulletin 4443 describing and illustrating Rotary Positive Vacuum Pumps, up to 29" vacuum. Also Pressure Blowers, Gas Pumps, Air Motors up to 25 lb. pressure.

53 SELF-CLEANING COOLANT FILTERS

U. S. Hoffman Machinery Corp.—Complete Catalog describing motor-driven sludge-collector mechanism, mounted in a steel tank fitted with filter plates, continuously removes the waste solids from grinding machine coolants. Parallel endless chains, running on sprockets, drag scraper bars up the sloping end of the tank and deposit sludge in any suitable container. The device permits continuous operation of larger grinding machines without delays for removal of metallic and abrasive particles from coolant sump or tank. The ample flow of clean coolant, up to 35 gallons per minute, improves finishes. The equipment is specially suited to aqueous coolants made up with soluble oil. It may also be used on kerosene or light oils. The filter is designated "Hoffman Model I-18V."

54 GRAPHITIC STEEL

Timken Roller Bearing Co.—The Timken Graphitic Booklet, 48-page handbook, describes in detail the characteristics of the five tool and die steels; namely, Graph-Mo, Graph-Tung, Graph-Sil, Graph-Al, and Graph-M.N.S. Gives the physical properties, heat treating procedure, and presents 47 specific applications with diagrams to illustrate. It presents a very comprehensive explanation of each of the five Graphitic Steels.

55 PISTON RINGS

C. Lee Cook Mfg. Co.—Piston Ring Bulletins, giving recommendations on ring types and materials for application to compressors and engines, have been prepared. Standard ring and groove sizes are listed.

56 AUTOMATIC INDUSTRIAL TIMERS

Paragon Electric Co.—New Engineering Bulletin giving construction, operation and installation data on automatic industrial timers. Stresses a notable new timer with eight improved features.

57 HOBBING AND SHARPENING MACHINE TOOLS

Barber-Colman Co.—Extensive Hobbing and Sharpening Machine Tool Catalog; well-illustrated details, features and advantages, dimen-

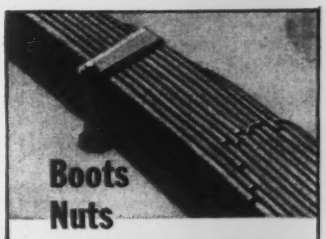
Continued on page 36

NO RE-TIGHTENING NECESSARY

One of the 1800 vehicles operated by Metropolitan Distributors, Inc. Boots Nuts were tested on trucks like this.

WHEREVER vibration loosens ordinary fastenings, Boots Nuts hold firm and safe. That's why, after the war, they will do away with the need for periodic tightening jobs on spring clips, body bolts, clutch pedals, universal joints, brakes, axle supports, wheel nuts and similar points . . . That's how they will minimize maintenance costs.

Since Boots Self-Locking Nuts are one-piece, all-metal, they are not affected by the corrosive action of oil, water and chemicals. Another advantage—they can be used again and again without accelerated locking loss of other self-locking nuts.



Boots Nuts Will Prevent This

This broken spring, costing $25.00 to replace, might have been prevented had nuts on spring clips stayed tight.

BOOTS SELF-LOCKING NUTS

"There's No Excuse for a Nut Shaking Loose"

Boots Aircraft Nut Corp. • General Offices, New Canaan, Conn.

CATALOG BRIEFS . . . LATEST INDUSTRIAL LITERATURE

sions and specifications. Describes automatic, hydraulic, taper spline, vertical, general purpose and production hobbing machines; automatic and combination reamer, hob and cutter sharpening machines. See advertisement page 48 in your Mechanical Catalog and Directory.

58 VARIABLE SPEED CONTROL

Reeves Pulley Co.—New 128-page Catalog G-435 shows how variable speed control can be applied to all types of production machines to step-up output and improve processing. Most comprehensive book on variable speed control ever published. Many specific examples, illustrations, revised dimensions diagrams and engineering tables. Complete details on latest improvements and additions to Reeves line. New sizes of units, new automatic controls and the new Reeves Reducer-Type Transmission, which provides speed variation and reduction in one compact unit.

59 FLEXIBLE COUPLINGS

Lovejoy Flexible Coupling Co.—Recently revised Catalog now includes new engineering data, revised and simplified finder charts, besides listing their entire line of L-R Flexible Couplings. This Catalog with celluloid index tabs for easily finding the desired sections, contains descriptions, prices, specifications, and blue prints of all the L-R Couplings in the Lovejoy line: also engineering data and Selector Tables to enable the engineer to find the proper coupling for every need.

60 STOKERS

Johnston & Jennings Co.—Stowe Compensating Feed Stoker Catalog No. 12. Thoroughly describes, illustrates and discusses unusual design, construction and operating features. Presents experience data on well known installations; representative settings for various coals and operating conditions. Shows why Stowe Stokers burn all bituminous coals with ideal combustion at high rates. See our advertisement, A.S.M.E. Mechanical Catalog page 165.

61 LEAD PENCILS

Eberhard Faber Pencil Co.—Folder printed in colors showing drawing pencil leads magnified and photographed for comparison. Photos proved ease of writing, consistency of degree, strength and smoothness of Microtomic Van Dyke Drawing Pencils.

62 MICROMATIC MICROHONING

Micromatic Hone Corp.—8-page Folder, Form AR67, 41 illustrations, contains a brief outline of hone abrading accomplishment, condensed specifications for several Models of Honing Machine Tools, and shows various types of honing tools, fixtures, etc., giving typical accomplishment data in regular production practice.

63 NUT AND BOLT PRODUCTS

Ohio Nut & Bolt Co.—Let Ohio Weld Nut and Bolt Products solve your fastening problems, by regular press or resistance welding making easier assemblies or watertight welds. Catalog No. 43 shows types and sizes available and also Ohio Thumb Screws and other Ohio Headed and Threaded Products.

64 TANKS AND TOWERS

W. E. Caldwell Co.—50-page Catalog No. 51 with illustrations and data on latest developments on wood and steel tanks and towers for all purposes. Also complete information on agitating and mixing equipment.

65 AUTOMATIC TUBE ICE MACHINES

Henry Vogt Machine Co.—New 20-page Bulletin, "Vogt Automatic Tube-Ice Machine." Describes process and operation of machine which makes sized-ice at once in its ultimate form. Typical installations shown and new uses suggested. Questionnaire sheet provided for prospective users desiring quotations.

66 AUTOMATIC CONTROLS

Mercoid Corp.—Catalog Number 600 is a handy reference book for engineers seeking information on the application of automatic controls. War demands are relying on American engineering ability to safeguard, improve and facilitate production in which automatic controls are increasingly serving essential requirements.

67 BLACK AND WHITE PRINTS

Charles Bruning Co.—"You Can Still Read by Kerosene" is the title of a new Booklet issued recently. The booklet presents interesting facts and specifications on the Bruning line of modern machines for the printing and developing of Black and White (black line) Prints and their time, cost and space-saving advantages.

68 FLEXIBLE METAL HOSE AND COUPLINGS

Chicago Metal Hose Corp.—Catalog G-42 entitled "Rex Flexible Metal Hose and Couplings," contains 38 pages of data, illustrations and descriptive matter on types and uses of flexible metal hose. In addition to their standard lines of Corrugated Flexible, Interlocked Flexible Metal Hose, full description and data is given on Stainless Steel Flexible Connections. Stainless Steel Bellows, and Fuel and Oil Hose, and Hydraulic Hose. Is indexed and arranged to facilitate selection of the proper types of hose, and to give as much information as possible concerning that type.

69 HEAT EXCHANGERS

Niagara Blower Co.—Bulletin No. 96 describes the Niagara Aero Heat Exchanger with Balanced Wet Bulb Temperature Control; 4 pages illustrated with installation photographs and operation diagrams. Shows the advantages of accurate, year-round controlled temperature cooling of liquids or gases, and the savings possible by the evaporative method.

70 STANDARD AND SPECIAL GAGES

Merz Engineering Co.—A portfolio of beautifully illustrated literature describing the four divisions—Engineering Research, Standard Gages, Special Gages and Contract Manufacturing—into which this company's service to industry is segregated.

71 MECHANICAL SPRINGS

Hunter Pressed Steel Co.—40-page Extract of its engineering department's voluminous data on springs. Filled with essential formulas for designing various compression, extension, conical and torsion springs and specifications, charts, curves, wire and sheet metal tables.

72 GRATING-FLOORING, SAFETY TREADS, ETC.

Irving Subway Grating Co.—Catalog No. F-225 contains illustrations, descriptions and engineering data on fireproof, durable, safe, clean and economical Gratings and Safety Steps—(riveted, pressure-locked and welded) for Industrial Plants, Power Plants, Refineries, Ships; Railroad Freight and Passenger Cars and Locomotives, Open Steel-Mesh Bridge Decking, etc.

73 STOKERS

Flynn & Emrich Co.—The most complete Catalog ever published by this firm. It reviews every feature of the four stokers in the Series—70 line—the Single Retort with Moving Grates and with Stationary Grates—the Double Retort with Moving Grates and with Stationary Grates. The Electro Hydraulic Drive and the Steam Drive are described and illustrated with easy-to-understand line drawings that show how they work. Diagrams of typical installations and automatic control applications give the engineer or architect the kind of information he seeks. Altogether, the 36 illustrations and their accompanying text give the reader an insight into what makes the "F & E" Stoker "tick."

74 BALL BEARINGS

New Departure Division General Motors Corp.—Latest Catalog entitled "New Departure Handbook Volume I, 16th Edition." An entirely new method of listing ball bearings has made the book more readily understandable by engineers and at the same time reduced the number of pages by 26. All variations of one basic bearing type are grouped together on opposing pages so that it can be readily seen what variations are available and in what sizes. Following wartime production policy, the higher production or preferred sizes are distinguished from non-preferred or smaller run bearings by means of two styles of type faces.

Make use of this . . .
FREE SERVICE
Fill in and Mail the coupon on page 31 without delay.

75 MECHANICAL LUBRICATORS

Nathan Mfg. Co.—Folder containing Bulletins on Nathan Valveless Mechanical Lubricators. Some of the types may be used with oil reservoirs remote from the lubricators. Information on independent sight-feeds adapted to be placed in delivery lines. Miscellaneous technical data regarding lubricator performance. Also interesting applications of lubricators to steam and diesel engines and general industrial machinery.

76 DRAWING PENCILS

Eagle Pencil Co.—A report of the Investigating Committees of Architects and Engineers on Eagle "Chemi-Sealed" Drawing Pencils together with a free sample of the pencil. The report testifies to the exceptional point strength, precision grading, smoothness and blue printing quality obtained by patented processes and proved by exclusive tests witnessed by the members of the Investigating Committee.

77 STEAM TURBINES

DeLaval Steam Turbine Co.—Bulletin E-1203 illustrating and describing the DeLaval Velocity-Stage Turbine. Designed to meet modern conditions of steam pressure and temperature.

78 PUMPS

Goulds Pumps, Inc.—Pump Data Sheets, a special wartime service to pump operators. Sheets include both elementary and advanced technical data on selection, installation, operation and maintenance of all types of industrial pumps for general and specialized services.

79 ENGINEERING LETTERING

Ralph C. Coxhead Corp.—New Booklet, giving practical instruction on the use of the Vari-Typer for the machine lettering of tracings of any size, either on paper or cloth, will be issued this month. Text matter is based on the experience of many engineers who are reducing the time formerly devoted to lettering in their drafting rooms by as much as 70 percent.

80 GASKETS AND WASHERS

Phoenix Specialty Mfg. Co.—Catalog describing plain corrugated metal, solid metal, corrugated metal-asbestos, single jacket asbestos, double jacket asbestos, doubled armored asbestos, corrugated jacket asbestos, French Style, composition and special shaped gaskets. Also washers, shims and pump valves. Designed to meet severe demands as required by power plants, processing plants, aviation companies, elevator manufacturers, instrument makers, U. S. Army and Navy.

81 SEAMLESS METAL BELLOWS

Fulton Sylphon Co.—Catalog describes manufacture of bellows. Shows bellows types available and lists many of the sizes that are currently produced. Bellows applications are pictured. Engineering information is given to enable the designer to incorporate the bellows in equipment being engineered.

82 STEAM TURBINES

Terry Steam Turbine Co.—Bulletins in looseleaf form which cover a complete description of Terry solid wheel turbines with cross section drawings of typical units for both moderate and high steam pressure conditions: a description of the Terry axial flow impulse, both single stage and multi-stage, Terry gears which are used for speed increasing and speed reducing.

83 NOISE AND VIBRATION MEASUREMENT

General Radio Co.—"The Noise Primer" a 48-page Booklet discussing the measurement of noise and vibration. In simple, everyday language, and with a minimum of technical terms, it tells what noise and vibration are, how they are measured, and what the measurements mean. This booklet takes the mystery out of noise measurements and brings them down to earth.

84 CENTRIFUGAL PUMPS

Frederick Iron & Steel Co.—Bulletin describing Centrifugal Pumps covering capacities up to 15,000 GPM and heads up to 600 lbs. Available is single stage and multi-stage design complete with base and coupling; also close coupled type with impeller mounted on extension of motor shaft for capacities up to 500 GPM and heads up to 220 feet.

85 LIQUID LEVEL GAGES

Liquidometer Corp.—Bulletin 6405 describes Liquidometer Automatic Reading Liquid Level gages including types for reading directly at tank and models for remote indication. Also describes

CATALOG BRIEFS

Levelometer Dial Type Hydrostatic Liquid Level Gages for use where automatic indication is not necessary. Liquidometers and Levelometers are used to gage practically any liquid that will flow.

86 AIR AND GAS COMPRESSORS

Norwalk Co.—Catalog No. 37, illustrating and describing Norwalk Multi-Stage Air and Gas Compressors, standard types and special service compressors. In this catalog is featured one of Norwalk's latest developments on page 22—The Norwalk Type SR-S5X. Five Stage Duplex Compressor for Pressures up to 15,000 pounds. All valves are very accessible. All stages are force feed lubricated. Running gear is equipped with Timken Roller Bearings. Built rugged and heavy for long and continued service.

87 BRAIDED PACKING

Garlock Packing Co.—Booklet describing a distinctly new development in braided packing—"Garlock Lattice-Braid Packing" available in several types and kinds of materials. It is an outstanding packing material with many exclusive features and with exceptional wearing qualities.

88 VALVES, FITTINGS, PIPE

Walworth Co.—Catalog 42, streamlined, 450 pages crammed full of helpful information to users of valves, fittings, pipe and pipe wrenches. Materials, dimensions, pressures, temperatures, and other engineering data are given in clearly indexed sections. The Engineering Data Section includes many original Charts and Tables helpful in figuring the sizes and types of piping necessary for particular operating conditions.

89 INDUSTRIAL OIL BURNERS

Petroleum Heat & Power Co.—Petro Industrial Oil Burner Catalog—concise detail of construction and operating range of rotary cup industrial oil burners, with specifications and capacities of all sizes at various boiler efficiencies; oil-viscosity chart and explanation of Thermal Viscosity System of preheating Bunker oils; typical installation specification.

90 COMPRESSOR VALVES

J. H. H. Voss Co.—Replacement problems concerning piston compressor valves of the old style heavy poppet valves or of outmoded small area plate or ribbon valves are described in a leaflet. These Voss Valves are designed for each individual job and are applicable to every type and make of air and gas compressor. Remarkable improvement in economy, reliability and safety of operation are explained with easily readable blueprints in the circular.

91 MARINE EQUIPMENT

Kraissl Co.—Bulletin A-1273 describes their Vacuum Gear Shift for Marine Reverse Gears. Bulletin A-1222 describes their Kraissl Marine Fuel Filters for small boats. Bulletin A-1275 describes their complete line of Marine Strainers and Filters. This Company has concentrated on equipment necessary for our war effort. Recent items that are described in current bulletins pertain particularly to requirements for Government boats.

92 POP SAFETY AND RELIEF VALVES

Ashton Valve Co.—Catalog No. 41 V illustrates and describes the Ashton Line of Safety Valves for Steam, Air, Gas and Liquid Service. The unique design of Ashton Pop Control is clearly set forth together with engineering data and information pertaining to the installation, care and maintenance of valves of these types.

93 SAFETY VALVE STANDARDS

J. E. Lonergan Co.—Information Bulletin #501, newly published, presents in condensed form the new standards adopted for iron, steel, and bronze safety valves, as promulgated by the National Bureau of Standards. The Bulletin illustrates and gives data relating to various types of Lonergan Safety Valves conforming to the new standards, and was prepared to facilitate selection and purchase of such equipment.

94 HIGH PRESSURE HYDRAULIC PUMPS AND VALVES

New York Air Brake Co.—A 4-page Pamphlet showing photographs, line drawings, volumetric and efficiency charts covering hydraulic pumps, valves, and accumulators. Equipment adaptable to machine tools, presses, testing units, earth-moving equipment and a wide variety of other applications.

95 PAPER MILL MACHINERY

Lobdell Co.—New Catalog of the 108-year Lobdell Co. illustrates and describes their entire line of machinery for paper and pulp industries, featuring the new completely automatic Roll Grinder; Machine Calender Stacks; Roll Calipers and Chilled Iron

Continued on page 38

LEAKY VALVES DON'T HELP PRODUCTION..

So Keep 'Em Tight

Fig. 1938
Steel Gate

The time necessary to maintain a careful check on valves . . . to see that they are kept tight and in good working order . . . is time well spent. Valves are tremendously important links in any production schedule.

Valve leakage of steam, water and air is not only costly in itself . . . it slows down production and can, if neglected, lead to serious delays and the loss of valuable time.

Lunkenheimer Valves, of whatever type, with their simplicity of design and built-in lasting qualities, are good insurance against production delays due to valve failure. They are helping many a maintenance crew do a better job.

A Lunkenheimer distributor is near you to assist you with your maintenance and operating problems. His facilities and experience are at your call.

Fig. 1430
Iron Body Gate

ESTABLISHED 1862

THE LUNKENHEIMER CO.

"QUALITY"

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NEW YORK 13 CHICAGO 6
BOSTON 10 PHILADELPHIA 7

EXPORT DEPT. 318-322 HUDSON ST., NEW YORK 13, N. Y.

Fig. 1640
"King-clip" Gate

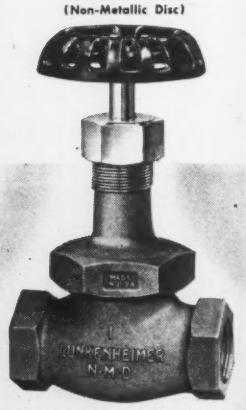


Fig. 123
"N-M-D" Globe
(Non-Metallic Disc)

Fig. 2125
Bronze Gate

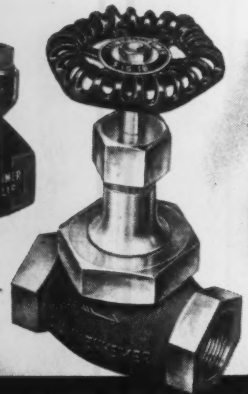


Fig. 16
"Renewo" Globe

LUNKENHEIMER VALVES

CATALOG BRIEFS

Rolls. Detailed photographs of Lobdell machinery and views of these machines in service included.

96 SPECIAL STEELS

Allegheny Ludlum Steel Corp.—"Handbook of Special Steels," revised, third printing. Pertinent information on the various grades of stainless, tool and other special alloy steels, for design engineers and production men. Contains complete data for guidance in the proper selection, treatment and use of these alloy steels, with finder charts and plenty of tables to facilitate quick reference.

97 SCOTCH MARINE BOILERS

Kewanee Boiler Corp.—4-page Catalog 99c reissued on Kewanee Scottie Junior Boilers. Five sizes 9 to 30 horse power, 100 lbs. pressure. Improvements include cast iron insulated sidehinged smokebox doors and frame instead of topswinging, shown with new cuts.

98 BOILER FEED WATER CONDITIONING AND CHEMISTRY

Cochrane Corp.—"Boiler Feed Water Conditioning And Chemistry," (Publication 4008), is a new publication just issued which deals with the most common processes used in feed water conditioning, and a discussion of such important factors as the characteristics of the hot process water softener, zeolite softener, removal of gases from boiler feed water, embrittlement and carry-over. In addition to this there is a section devoted to interpretation of water analyses, conversion factors, chemical reactions, tables showing the formula, molecular weights, equivalent weights of all the chemicals commonly found in water conditioning practice.

99 COOLING WATER PROBLEMS

D. W. Haering & Co.—"Cooling Waters," a collection of articles by noted authorities on the control of corrosion, algae and scale in industrial cooling systems. This 48-page Booklet discusses condenser tube corrosion control by the use of copper or nickel alloys and the use of chemical inhibitors.

100 FRICTION CLUTCHES

Carlyle Johnson Machine Co.—Clutch Catalog containing revised data covering the Johnson Standard type as well as the Super-Johnson type expanding friction ring clutch, a small, compact design for light powered drives. Also separate dimensioned Bulletin, series No. 3 covering their new "Naxtorq" Multiple Disc type of clutch in five sizes, No. 22, No. 23, No. 24, No. 25 and No. 26, both single and double, wet type as well as dry type. This new design of Multiple Disc clutch is a unit which can be manually assembled or disassembled and on which the discs are free running when in neutral without drag or abrasion. A clutch which can be manually adjusted with ease by simply lifting the locking spring. No. 21 smaller, as well as No. 27 and No. 28, larger sizes now being designed and will be listed in future Catalog issues.

101 PACKINGS AND MECHANICAL SEALS

Crane Packing Co.—96-page Catalog describes John Crane metallic, plastic and fabric packings for steam, water, gases, oils, chemicals and refrigerants. High temperatures, pressures and speeds. Also packing lubricants and condenser tube packings. Separate illustrated bulletins on insoluble pipe-joint compound, bellows type pump seal, new mechanical shaft seal.

102 GASKETS

Metallo Gasket Co.—Catalog 43 fully describes Metallo Gaskets for permanent sealing of every power and processing joint. Made in a wide variety of styles—in copper, stainless steel, chrome-iron, armco iron, aluminum, Monel metal, lead and lead alloys.

103 LOW TEMPERATURE WELDING

Eutectic Welding Alloys Co.—Publish a monthly magazine, "The Eutectic Welder," which contains latest information on welding news, design, metallurgy methods, cost analysis, useful tools and helpful hints. You may become a regular subscriber to this paper.

104 FLOTATION FUELING SYSTEM

Neptune Meter Co.—"Delivering the fuel—to Keep 'Em Flying," a descriptive book on the Aqua Flotation System—handsomely illustrated with many photographs and diagrammatic drawings. Safer and more economical storage of high octane gasoline and a modern controlled and dependable system of filling planes, motor vehicles and boats with "dry," dirt-free fuel are the advantages emphasized.

105 WIRE ROPE SLINGS

John A. Roebling's Sons Co.—72-page Catalog showing various types of Roebling slings. This catalog gives data on wire rope and grommet slings

CATALOG BRIEFS . . . LATEST INDUSTRIAL LITERATURE

for both standard and special uses, and also the new Roebling "Flatweave" Sling. In addition to recommended safe loads and size ranges, the book is profusely illustrated with application pictures of slings in actual service. A section of the book is devoted to the various types of wire rope fittings which are used in connection with slings.

106 VIBRATORY MATERIAL HANDLING EQUIPMENT

Syntron Co.—Complete line of Vibratory Material Handling equipment, including Electric Vibrators, Vibratory Packers, "Vibra-Flow" Feeder Conveyors, Dry Chemical Feeder Machines, "Weigh-Flow" Gravimetric Feeder Machines, hydraulically operated Vibrators and Feeder Machines, profusely illustrated and described in new Catalog No. 440.

107 CLUTCHES

Rockford Drilling Machine Division, Borg-Warner Corp.—Literature is available on many different types of Clutches, Multiple Disc, Single and Double Plate, for use on Machine Tools, Trucks, Tractors, Industrial Locomotives, Cranes, Hoists and industrial machinery of all kinds requiring a Clutch control.

108 VERTICAL TRANSPORTATION

Sedgwick Machine Works.—"Giving A Lift to The World For Fifty Years"—a handsomely illustrated Booklet tells the story of how man was lifted from the depths of the uncertain '90's to the heights of the mechanical age. A story of the 50 years in which man's steps have been reduced and his stride increased by the elevators and dumb waiters manufactured by this company.

109 SOCKET SCREWS—SET SCREWS

Standard Pressed Steel Co.—Bulletin 570 covers the entire line of "Unbrako" Socket Screw Products, socket head cap screws, hollow set screws, self-locking set screws, special screws, stripper bolts, self-locking nuts, etc. Also shown is the line of Shop Furniture of Steel.

110 HYDRAULIC SEALS

Linear Packing & Rubber Co.—New Booklet, "Linear Aircraft Hydraulic Seals," contains 24 pages of design drawings, dimension tables and installation data on moulded V-Ring, O-Ring and U-Cup hydraulic packings to A-N specifications. Complete 64-page Catalog covering all types of Linear Mechanical Packings, Sheets and Gaskets is also available.

111 UNAFLOW STEAM ENGINES

Skinner Engine Co.—New Edition Multi-Cylinder, Vertical, "Universal Unaflow" (stationary) Steam Engine Catalog. Discusses unaflow principle in comparison with "counterflow" type formerly in general use. Illustrates and describes exclusive designs employed by Skinner for highest economy. Same fundamental design as Skinner single-cylinder poppet valve horizontal "Universal Unaflow."

112 STEAM BOILERS

Mears-Kane-Ofeldt, Inc.—Bulletin No. 2G provides data on the construction, automatic controls and operation of Kane Gas-Fired Steam Boilers in sizes from 1 to 30 H.P.

113 BALL AND ROLLER BEARINGS

S K F Industries, Inc.—"How to Install and Care for Bearings" is the title of a handy 18″ x 24″ three-color wall chart. Several illustrations accompany short pithy text on the essentials of bearing installation and maintenance.

114 PRINT REPRODUCTION PROCESS

Keuffel & Esser Co.—"Photact," the new Keuffel & Esser reproduction process that preserves, restores and duplicates original drawings, described in 8-page Booklet. With "Photact" original drawings are used only once, then filed, safe from wear and tear. "Photact" makes reproductions of originals—as many as Departments, Branches, Sub-Contractors need—with inklike line on tracing cloth or tracing paper. "Photact" masterprints give clear, consistent blueprints or blackline prints.

115 ASBESTOS PRODUCTS

Johns-Manville—Catalog GI-6A, an 8 × 11, 52-page book. Gives complete description of Johns-Manville industrial products. Halftone illustrations of materials and their application. Includes construction details and engineering data tables. Materials described include Insulation, Refractories, Floorings, Roofings and Sidings, Asbestos Transite Walls, Industrial Curtain Walls, Transite Pressure, Sewer and Flue Pipe, Friction Materials, Electrical Materials and Packings.

116 INDICATING, RECORDING AND CONTROLLING INSTRUMENTS

Foxboro Co.—Catalog 95-A newly revised, is the most comprehensive bulletin ever issued presenting the company's complete line of indicating, recording and controlling instruments. Much valuable engineering data is given. All information is departmentalized and conveniently cross-indexed. There are 200 illustrations.

117 PRESSURE AND LEVEL CONTROL VALVES

Kieley & Mueller, Inc.—Capacity table section of their Catalog which is proving very valuable in sizing valves for control applications. Page 1001 consists of Water Capacity Tables together with correction factors. Pages 1002 and 1003 deal with Steam Tables and Steam Capacities. Page 1004 deals with Air and Gas Capacities. Includes superheater steam correction factors.

118 PRESSURE GAUGES

Manning, Maxwell & Moore, Inc.—Latest Ashcroft Gauge Catalog, covers a wide range of indicating gauges, recording gauges, duragauges, and gauge testers, many of them in the very latest streamlined cases. This wide range of gauges covers practically every use to which a gauge can be put—for industrial uses, utilities, oil fields, etc. Ashcroft gauges are made in all sizes, from 2½″ up to 24″ dial size. All pressures, from a few ounces of water pressure up to 25,000 pounds per square inch, and from the most inexpensive types to the finest gauges made. Of all kinds of materials, for all services, such as water, steam, air, oil, gas, brine and any chemical. They are guaranteed accurate to a small fraction of the scale range.

119 BRONZE

American Manganese Bronze Co.—2-page Folder giving the Government Specifications for their Hy-

Continued on Page 40

ROPER *Rotary* PUMPS

ONLY 2 MOVING PARTS

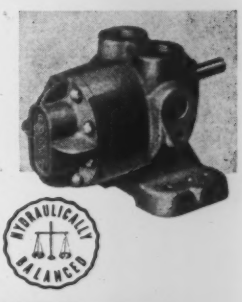
Just two equal size pumping gears operating in a case with proper clearance so there is no perceptible wear on case or gears.

LONGER IN SERVICE

Roper Pumps, quiet and smooth in operation, last longer because internal pressure is equalized at all points. Pumping gears actually float in operation, being entirely separate from the drive shaft and connected by a smooth, sliding joint which absorbs all shock and thrust.

Another good design feature . . . gears and bearings can be inspected without disturbing piping or power.

Write for Bulletin 556



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FRASER-BRACE ENGINEERING CO., Inc.

Design, construction and installation of complete plants and projects

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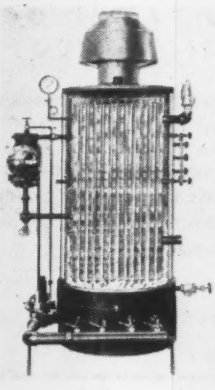


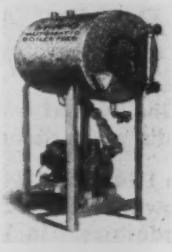
Consider *now* the CANNING SEASON

Yes it's true, the canning season is still a few months away, but you are now busy and we are busy—so help prepare for the canning season *now* by ordering your equipment and supplies well in advance.

The Kane Automatic Gas-Fired Steam Boiler supplies *plenty of clean, constant-pressure steam* for Jacketed Kettles, Steamers, Autoclaves, etc.—and, remember, it burns fuel only in proportion to the actual amount of steam required.

Send for literature data and prices.

Illustration showing unique construction of KANE Automatic Gas-Fired Boiler. A jacket of steel and asbestos, placed around (but not against) boiler permits hot gases of combustion to pass by spiral baffles around the shell, as well as through tubes—utilizing shell for heating surface. Result: high quality steam . . . exceptional fuel economy . . . more horsepower in proportion to space occupied. Sizes: 1 to 30 H.P. A.S.M.E. code construction.



Above M-K-O Automatic Boiler Feed System eliminates feed water worries . . . saves fuel . . . boosts efficiency.

MEARS-KANE-OFELDT INC.

Manufacturers of Automatic Steam Boilers for over a third of a century.

1903-1915 EAST HAGERT STREET, PHILADELPHIA 25, PA.

FOR those who USE PUMPS

Comprehensive data and diagrams of operating principle of swinging vane type rotary pumps.

Send for this folder NOW.

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Our engineers are at your service on any problem involving pumps.

BLACKMER PUMP COMPANY
1920 Century Ave. Grand Rapids 9, Mich.

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ten-sl Bronze.. This high test material, availablein hot rolled rod, forgings and castings, is specified for the most exacting service by the Army and Navy for Ordnance and Aircraft.

120 HEATING SURFACE ELEMENTS

John J. Nesbitt, Inc.—New Catalog, Publication No. 237, presenting Single Sections of this Freeze-proof Heating Surface with Dual Steam-distributing Tubes or Duplex Sections for long lengths, in alternative all-steel construction. Physical data, final temperature charts, capacity tables, and piping diagrams are among helpful descriptive matter included.

121 DIE-LESS DUPLICATING

O'Neil-Irwin Mfg. Co.—Die-Less Duplicating was developed by this company from over 20 years' experience in the die making and metal stamping business. Die-Less Duplicating is obtained by application of specially designed benders, brakes, and shears, developed for this purpose to eliminate dies and die sets. The new 40-page "Die-Acro" Catalog, No. 44–6, contains a full outline of Die-Less Duplicating on pages 2 and 3 with a center spread featuring the historical background and development of this new technique.

122 VIBRATION ELIMINATION

Lord Manufacturing Co.—Bulletins 103 and 104 describing Lord Shear Type, Bonded Rubber Mountings isolate vibration, absorb shock, minimize noise transmission. Compact, sturdy, light weight. Ease of installation is important feature. Standard mountings made in tube and plate forms . . . Various shapes . . . many sizes . . . load ratings of standard mountings range from a few ounces to 1500 pounds. Designed for application on all types of mechanical and electrical devices from delicate instruments to massive equipment. Other products are Fractional H.P. couplings, torsion bushings, turnbuckles, diaphragms, meter mountings, and other Bonded Rubber products.

123 MAGNETIC DRAIN PLUGS

Lisle Corp.—Interesting uses and applications of Lisle Magnetic Drain Plugs are described in a newly revised Catalog offered by the Lisle Corp. This booklet explains how and where Lisle Plugs can be used efficiently to measure and control excessive wear, and to prevent premature failure of bearings. Catalog includes complete specifications and general recommendations for proper usage.

124 FLEXIBLE BALL JOINTS

Barco Mfg. Co.—Catalog No. 208 describes a few of the large line of Barco flexible ball joints, which are available to the industries. These joints are in use on the railroads, in the oil fields, chemical industries and many other industries. They are used for conveying steam, water, oil, air and many other fluids where flexibility is required in the line, or where it is required to overcome pipe strains from expansion and contraction and vibration.

125 LOCK NUTS

An-cor-lox Div., Laminated Shim Co.—The An-cor-lox Lock Nut is fully described in a comprehensive Folder recently issued which is replete with diagrammatic, photographic and factual matter on An-cor-lox styles, materials, designs and finishes; application instructions; and suggestions for parts conversion to the An-cor-lox function. The An-cor-lox Lock Nut itself is self-contained, with all-metal construction, and is devised both for extreme locking security, and speed and ease in applying. Besides being re-usable, the An-cor-lox is remarkable in that its locking power actually increases with repeated re-use.

126 HEAVY-DUTY PLANERS

Liberty Planers—New Liberty Planer Catalog which illustrates and describes Planers sized up to 132″ for handling big scale cuttings faster and to closer tolerances than heretofore thought possible, due to Electro-Mechanical Feed . . . Automatic Tool Lifters . . . Forced Feed Lubrication . . . Stationary Screws, Revolving Nuts, etc. Cutting speeds 4 feet to 133 feet per minute.

127 HIGH-LEAD BRONZE

Bearium Metals Corp.—Chart available listing sizes and weights of cored and solid Bearium Metal bars 12″ long carried in stock, available for immediate shipment. Chart also provides guidance in determining proper grade Bearium Metal for various conditions of sleeve bearing service. Stock to allow for finish of various size bars also indicated.

128 TEMPERATURE AND HUMIDITY CONTROL EQUIPMENT

Carrier Corp.—Reviewing forty-two years experience in industrial installations of temperature and humidity control equipment, this brochure delineates a few of the problems which engage the industry and is called "Problems & Solutions." Illustrating the problem of tempering steel for uniform hardness Carrier reports the method used in breaking a production "bottleneck" through temperature control of solution in the tanks in which steel knives are quenched. Further illustrations describe the problems encountered in the plastics industry where resins are unworkable under certain atmospheric conditions. In all, specific problems and solutions in 8 industries are presented, the fields covered being steel manufacture, the plastics, aviation, drug, cosmetic, dehydration glass and munitions industries.

129 VALVES

Reed Roller Bit Co.—Reed Valve Catalog '41 is a cloth bound book containing 80 pages of tables and information giving dimensions, prices, and descriptions of the Reed Valve. A large section is devoted to tables of engineering data found useful in connection with piping and steam problems.

130 JACKS

Templeton, Kenly & Co.—Makers of the "Simplex" line of jacks for all purposes, New Vest Pocket Catalog, No. 44 which lists, illustrates and describes all types of lever, screw and hydraulic jacks, and special jacks for all purposes including railroad jacks, mine roof jacks, airplane jacks, pole pullers, push-and-pull, trench braces, the new Simplex Jenny Stern Tube Puller with capacities up to 100-tons and many others.

131 HYDRAULIC CYLINDERS

Hannifin Mfg. Co.—Bulletin No. 62, condensed Catalog describing Hannifin hydraulic cylinders, pneumatic cylinders and air control valves. Contains complete descriptions of Hannifin cylinders and valves, together with condensed tables of dimensions giving the principal information required by designers for the application of hydraulic cylinders, pneumatic cylinders, and air control valves. Hannifin hydraulic cylinders are available in seven standard mounting types. Hannifin pneumatic cylinders are available in five standard mounting types. Series R pneumatic cylinders, available in a complete range of sizes.

132 WELDED STEEL TUBING

Republic Steel Corp., Steel and Tubes Div.—Supplying free copies of their "Handbook of Welded Steel

PROOF OF THE PUDDING

REPEAT orders were over 70% of DOWNINGTOWN'S 1942-3 BUSINESS

Quality and craftsmanship are proven in this fact. A good product makes a satisfied customer—a satisfied customer comes back for more.

In 1942 and 1943 *one customer* placed 46 repeat orders covering 177 Downingtown Heat Exchangers. This customer is one of America's largest process industries. In 1942 and 1943 *another commercial customer* bought 227 heat exchangers in 14 orders from Downingtown.

Downingtown's Heat Exchanger Division is manned and equipped to design, layout, and manufacture a wide variety of Shell and Tube Heat Exchangers.

HEAT TRANSFER DIVISION
DOWNINGTOWN IRON WORKS, DOWNINGTOWN, PA.

CATALOG BRIEFS

Tubing." Contains complete information about the process and the product, as well as technical data needed by design engineers in writing specifications. Includes data on tolerances, physical properties, weight tables, and elements of sections.

133 OIL BURNERS

Peabody Engineering Corp.—Bulletin No. 107 which gives a technical description of the Peabody Constant Differential (CD) System as applied to Peabody Wide Range Mechanical Atomizing Oil Burners. Also Bulletin No. 108 describing Peabody Type A and Type H Oil Burners, as well as Bulletin No. 203 describing Peabody Type A and Type H Gas and Oil Burners.

134 COLD-FORGED NAILS, RIVETS, SCREWS, ETC.

John Hassall, Inc.—Complete Catalog No. 4 containing a wealth of information on Cold-forged Nails, Rivets, Screws, and other items in hundreds of uncommon types. Specialties that will suggest to you how to improve the appearance or effectiveness of your product at minimum cost. Compiled by specialists in cold forging since 1850.

135 AUTOMATIC CONTROLLERS

Hays Corp.—Bulletin 43-606, "Hays Automatic Controllers For Measurement And Control Of Pressure, Flow Speed And Level." This is a 48-page Booklet on Automatic Controllers, their characteristics, construction, and purpose. It is well illustrated with schematic drawings showing how various types of controllers are applied to definite problems. A valuable book for the man interested in the measurement and control of pressure, flow speed or level.

136 OIL HYDRAULIC PUMPS AND VALVES

Racine Tool & Machine Co.—Oil Hydraulic Variable Volume Pumps—Capacities 0-30 gal. per min. at 50 to 1000 lb. pressure per square inch. Available with either manual, electrical or mechanical control devices. Complete line of Four-Way Oil Hydraulic Valves featuring "Sleeve type balanced piston" construction—sizes $\frac{3}{8}$ to $1\frac{1}{2}$. Also Oil Hydraulic Boosters for converting low pressure systems into high pressure systems with no increase in horsepower. Available in ratios of 3 to 1 to 7 to 1. All fully described in Catalog No. P-10-C.

137 THRUST BEARINGS

Kingsbury Machine Works, Inc.—Bulletin G-1 shows the general character of Kingsbury Self-Contained Thrust Bearings, also explains the principle involved and illustrates the standard types of 2, 3, and 6 shoe mountings. These bearings are used for propeller thrust on ships driven by reciprocating engines, Diesel engines, geared turbines, and electric motors. Another important use is on dredge pumps.

138 INSULATION MATERIALS

Philip Carey Mfg. Co.—Catalog describing the use and properties of insulation materials for temperatures from zero to 2500° F. Contains charts showing proper thickness of covering and tables covering properties of saturated steam, heat loss covering from bare pipes and efficiencies of pipe coverings.

139 PUNCHES, CUTTERS BENDERS

T. H. Lewthwaite Machine Co.—Catalog No. 8. This handy Booklet illustrates and describes their complete line of metal-working tools. Included are hand-powered punches, cutters, and benders of various capacities; punches and dies in round, square, oval, and rectangular sizes to fit power presses, foot and hand machines of all makes; punch coupling nuts; die beds; punch chucks; and other accessories.

140 TEMPERATURE CONTROLS

Sarco Co.—New Bulletin, No. 650, just published, describes special temperature controls for degreasing and other metal cleaning machines. Simple self-operated controls for both heating and cooling are said to maintain vapor lines on degreasers within narrow limits. At the same time they are claimed to effect substantial savings in solvent and water. The bulletin gives complete description and includes installation details, capacity tables, and other engineering data.

141 STELLITE TOOLS

Haynes Stellite Co.—New Booklet entitled "Operating Information on Stellite 98M2 Cobalt-Chromium-Tungsten Turning and Boring Tools and Milling Cutters." It is intended to help users obtain the best possible results with 98M2, the cast cobalt-base alloy which was developed especially for faster machining of steel. Through drawings, photographs, and charts, this eight-page booklet explains the cutting angles, speeds and feeds, chip-breaker grinds and grinding wheels that are recommended for use with Stellite 98M2 turning and boring tools and milling cutter blades.

Continued on Page 42

Introducing the KENNAMILL

The amazingly simplified inserted-blade step-cutter that makes high-speed carbide face-milling of steel possible in every shop!

Partially completed cut illustrating method of flycutting in steps—note bright, smooth finish obtained.

A sensational Kennametal achievement—the KENNAMILL—can give new life to your milling machines . . . adapting them for the high speed milling of steel that is inherent in modern, negative rake carbide cutters. At the same time, the Kennamill can improve the quality of your work by producing finished surfaces that are exceptionally smooth and accurate.

Kennamills are inserted-blade cutters, available in four sizes with taper shanks to fit standard spindles, as listed below. All sizes use the same $\frac{5}{8}$" square, 10° negative back rake Kennametal-tipped blade (Cat. No. 39M40). Two sets of blades are supplied with each cutter head.

The low initial cost of Kennamills is combined with economy of blade maintenance. No expensive grinding equipment is needed—the blades are easily removed from the cutter head and resharpened to a template on a simple adjustable table carbide grinder. Accurate resetting in the head is not necessary since each blade cuts an independent path.

The use of Kennamills assures optimum machine performance. The sturdiness of the cutter body, plus distribution of the work over the keen-cutting Kennametal-tipped blades, minimizes vibration and chatter, smoothes out the load, and fully utilizes available horsepower, with feeds up to 21" per minute.

Kennamills are available for immediate delivery. They are stocked at our factory, and at Kennametal offices in Atlanta, Chicago, Detroit, Houston, Los Angeles, Philadelphia, New York, and San Francisco. Get in tune with the fast-moving tempo of carbide steel milling—order Kennamills today.

PRICES OF KENNAMILLS
(Complete, with 2 sets of No. 39M40 Kennametal-tipped blades)

Size	Fits Spindle	No. of Blades in Cutter	Price Each
2"-40	#40	3	$31.91
2"-50	#50	3	35.41
3"-40	#40	4	39.99
3"-50	#50	4	41.22
4"-50	#50	4	43.04
5"-50	#50	4	44.85

Extra Blades (No. 39M40) each $1.83
Templates—for regrinding blades—each $1.75

KENNAMETAL
SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., 367 LLOYD AVE., LATROBE, PA.

CATALOG BRIEFS . . . LATEST INDUSTRIAL LITERATURE

142 STOKERS

Detroit Stoker Co.—Catalogs of many Detroit Stokers, Underfeed and Spreader types for all makes and types of boilers. The various designs represent over forty-five years' experience in Stoker manufacture exclusively. Wide range of sizes and capacities from approximately 50 H.P. and upwards. The purchaser is assured a Detroit Stoker, best suited to his particular boiler, kind of coal available and load to be carried. Detroit Stokers are sold by direct representatives. Proper design and application by experienced builders produce best results.

143 POWER TRANSMISSION EQUIPMENT

T. B. Wood's Sons Co.—Catalog No. 82 shows Wood's full line of general transmission machinery, including roller bearing pillow blocks, ball bearing pillow blocks, shaft hangers, couplings—both rigid and flexible, V-belt drives, friction clutches and flat belt pulleys together with all other appliances for the transmission of power by belts or ropes. It includes also a number of useful engineering tables and other data regularly needed by the operating engineer.

144 OIL AND GAS BURNERS

Hauck Mfg. Co.—"Hauck Industrial Combustion Data" just off the press. It is a reference for anyone concerned with the selection, installation, operation and maintenance of combustion equipment, either oil or gas, on furnaces, ovens, kilns, retorts and other heat processing equipment. 112 pages packed solid with "down-to-earth" data on industrial combustion and heating practice.

145 FLOW RATE MEASUREMENT

Fischer & Porter Co.—New, highly-interesting, highly-instructive Catalog on the F & P Rotameter, the area-type flow meter that has gained such widespread acceptance for accurately measuring the flow rate of liquids and gases. This catalog . . . 10-B, entitled "A New Era in Flow Rate Measurement" contains 32 pages of the latest authoritative information on this revolutionary instrument. Each basic advantage of the Rotameter is thoroughly discussed . . . How it works . . . Its extremely high accuracy . . . Its viscosity and temperature immunity, etc. Large, semi-humorous illustrations dramatize each point to make it readily understandable. A list of fluids successfully handled, and some typical applications are included.

146 PUMPS

Aurora Pump Co.—Condensed Catalog embodying illustrations, suggested uses, specifications and condensed selection tables for Aurora Centrifugal and Apco Turbine-Type Pumps and Water Systems. Inquirers may obtain further information on any types shown by writing for special bulletins containing additional information.

147 VERTICAL AND HORIZONTAL HONING

Barnes Drill Co.—Bulletin No. 121-F, 12 pages, entitled "The Barnesdril Honing Process and Self-oiling Hydraulic Honing Machines" covers the process of honing, both vertical and horizontal, and a brief description of parts which may be honed and machines on which they should be honed.

148 AIR CYLINDERS

Tomkins-Johnson Co.—New 92-page Catalog describing T-J air cylinders for power movement in any direction and in any mounting. Contains blueprints and specifications for 112 different non-rotating cylinders in 7 standard styles and double end rod types. Sizes from 1½" to 14" bore. Capacities from 100 lb. to 12,000 lb. power movement.

149 BACK-TO-BOILER SYSTEM

Morehead Mfg. Co.—Bulletins describing Tilt-type Return and Non-Return Traps, Exhausteam Purifiers and Direct Pressure Liquivators for drainage of steam heated equipment, boiler feeding and transportation of liquids; illustrations, cross-sections, schematic diagrams, size, capacity, and dimension tables, application data, etc.

150 CUT TOOTH GEARS

W. A. Jones Foundry & Machine Co.—224-page Catalog. Gear practice has changed with the times and this catalog covers the latest engineering and design information needed to apply every type of cut tooth gear for almost every conceivable type of machinery application or drive problem. An unusually comprehensive work on Gears. The engineering section contains the latest technical data relating to present day gear practice.

151 AUTOMATIC WEIGHING EQUIPMENT

Merrick Scale Co.—Bulletin No. 643 which shows applications of Merrick Weightometer for successfully weighing in transit all kinds of bulk materials carried by belt and other type conveyors. In this bulletin a few typical engineered applications of the Weightometer Type "S" are shown to acquaint the reader with the possibilities of the equipment in industry.

152 VALUE OF CONSERVATION WELDING

American Manganese Steel Div., American Brake Shoe Co.—New Bulletin 344W describes reclamation of worn parts, and shows how to cut replacement costs through use of Amsco Build-Up and Hard-Facing Welding Rods. Illustrated with actual photographs of welding applications on badly worn crusher mantles, clamshell teeth, tractor sprocket wheels, coke pusher shoes, pulverizer hammers, etc.

153 PROCESS EQUIPMENT

American Locomotive Co., Alco Products Div.—Bulletin 1030 which shows diversity of products manufactured for the oil industry, chemical industry, power plants, marine service, municipalities, and for general industry.

154 TRACING CLOTH AND PENCIL CLOTH

Arkwright Finishing Co.—Convenient size Catalog, 3½" x 6½" showing five leading brands of Tracing Cloth and Pencil Cloth now being offered. Also included are helpful hints on the essential qualities of good tracing cloth and what to look for when buying.

155 PORTABLE AIR COMPRESSORS

Chicago Pneumatic Tool Co.—CP Catalog No. 500 is a 16-page condensation of all the essential data pertaining to the complete line of CP Stationary and Portable Air Compressors. Plentifully illustrated, with specification tables for each type of compressor and featuring a "selection chart," Catalog 500 is a fast-reading, fact-full booklet that anyone seeking data on air compressors will find a welcome source of information on the subject.

156 PULVERIZERS

Babcock & Wilcox Co.—Bulletin G30-A—describes The B & W Type E pulverizer, designed and built to pulverize coal for firing steam boilers, cement and lime kilns, metallurgical furnaces and other similar applications. The Type E pulverizer is available in 15 sizes, and in capacities from 3,100 to 25,000 lb. of coal per hour.

157 BUCKETS

The Hayward Co.—New 16-page vest-pocket Guide on its complete line of digging and rehandling buckets. This illustrated factual publication is designed for the busy operating man who wants a quick picture of the improved types of buckets now available, the uses for which each is recommended, the capacities and sizes obtainable. Information and data are given on Rehandling and Digging Clam Shell Buckets, Electric Motor Buckets, Standard and Multi-Power Orange Peel Buckets, Sewer Catch Basin Buckets, Automatic Take-up Reels and Grapples for a wide variety of materials such as tiered wood, manure, rocks, tree trunks and pulp wood. Copies are available by sending a request to the manufacturer.

158 FERRO-ALLOYS

Electro Metallurgical Co.—40-page Booklet describes "Electromet" ferro-alloys and metals, gives suggestions for their use, and tells briefly how the various alloying elements affect the properties of the metals to which they are added. The booklet is designed primarily for reference use by foundrymen and steelmakers.

159 REGULATORS AND VALVES

Ruggles-Klingemann Mfg. Co.—New Bulletin No. 25 contains illustrations of practically every type of regulator and valve they manufacture. On the back page there is an index referring to the various bulletins of their complete catalog.

160 BALL BEARINGS

Fafnir Bearing Co.—A comprehensive review of the principles affecting the selection, application and operation of anti-friction bearings in the form of an engineering manual totaling almost 200 pages. Of interest is a complete resume of the engineering fundamentals involved in correlating design requirements, load characteristics and service conditions to the choice of the particular size and type of bearing.

161 HEAVY DUTY CARGO CONVEYORS

George Haiss Mfg. Co.—Pamphlet on heavy duty cargo conveyor for stevedoring or stacking jobs for warehouses, industrial plants, docks, etc. in four sizes from 20 ft. to 35 ft. Belt four ply 28 oz. duck, covered with 2500–3000 tire tread stock. Truss frame construction. Conveyor belt overlaps flat top member of conveyor frame. Gasoline or Electric motor drive.

162 FLARED TUBE FITTINGS

Grinnell Co.—Catalog 2-R, covering the Grinnell Superseal Flared Tube Fitting, embodies a design which lends itself to manufacture from all metals, thus making it adaptable for use with all types of tubing. Long 10-degree tapered cone provides greater seating area for tubing flare, assuring a leak-proof joint under maximum vibration and pressure.

163 BOILER WATER CONTROL

Henszey Co.—36-page Booklet entitled "Boiler Water Impurities and their Control," describes boiler water troubles, boiler water impurities, including various chemicals found in it, gives system for analyzing water and describes methods for control.

164 FOLDING TERMINAL LUGS

Krueger & Hudepohl—Bulletin 8-DF illustrates new and larger sizes, which discusses folding double cupped washer lugs with and without insulation grip, has just been issued. These lugs have a design such as to bring the wire directly under the binding nut to insure maximum conductivity to the connection. Also shown are single cup washer lugs and narrow folding lugs with and without insulation grips.

165 PRESSURE OIL FILTERS

Wm. W. Nugent & Co.—New edition of Bulletin No. 7A comprises 32 pages, with numerous illustrations, not only of the Pressure Oil Filter and its operation, but every conceivable application. Any liquid that contains foreign solids, as small as .0003", that will not destroy the filtering medium of its parts, can be successfully handled.

166 DROP FORGINGS ON FLAT DIE HAMMERS

Kropp Forge Co.—March 1944 number of "Forgings" external house organ, features illustrated article on methods employed by Kropp hammersmiths in producing drop forgings of odd or intricate shapes on flat die hammers. Delays in securing dies and shortage of expert die sinkers necessitate this ingenious forging practice. Valuable information for buyers of drop forgings.

167 ELECTRIC WELDING EQUIPMENT

Lincoln Electric Co.—"Engine Driven Model SA-200," a comprehensive 4-page Bulletin describing the new 200-ampere "Shield-Arc" engine-driven arc welder, is printed in two colors and attractively illustrated. Describes the innovations incorporated in the design of this latest addition to the Lincoln line of arc welding machines and carries complete specification on various parts of the unit including the engine. Details such as dimensions, welding accessories and running gear also given.

168 PNEUMATIC ASH CONVEYORS

Luria Steel & Trading Corp., Hahn Engrg. Div.—Pamphlets on pneumatic ash conveyors, sectional storage units, tile storage units, steam and air washers, fixed nozzle mechanical soot blowers. Thermo-Clone pneumatic ash conveyor separates steam and ashes, delivers dry ashes, does not pack, washes dust from steam and air mixture before exhausting into atmosphere.

169 STEEL FORGINGS

National Forge & Ordnance Co.—Monthly Date Book—a monthly dated memo reminder book for the pocket. Each month some interesting feature in connection with their shop or with their activities is described. Each issue also carries an illustration of some of their products or some operation in their shop.

170 FORGINGS

Steel Improvement & Forge Co.—"Improvement of Metals by Forging": Technical Reference Data Book including information on types and characteristics of forgings, forging design, process operations, forging metallurgy, grain flow, inspection procedures, machining forgeable ferrous, non-ferrous metals and tables of information useful to design engineers, metallurgists and production executives. 36 pages illustrated with reproductions of photographs showing technical operations and design drawings pointing out technical features.

171 FLANGE PROTECTORS

Melrath Supply & Gasket Co.—Bulletin describing "Melco" Flange Protectors, a new development which is not included in their catalog, to replace the heavy, more costly and less satisfactory method of protecting machined and flanged surfaces. "Melco" protectors were developed and are being used by every concern to which samples were sent.

CATALOG BRIEFS

172 LUBRICATION

Lubriplate Div., Fiske Brothers Refining Co.—Two recent issues of "The Lubriplate Film" Nos. 7-43 and 11-43 are of special value to all who are interested in proper lubrication and maintenance of motor trucks, construction and agricultural machinery. These two very attractively prepared bulletins contain much timely data relating to the very important subject of preventive maintenance.

173 COMPLETE LUBRICATION PLAN FOR INDUSTRY

Sun Oil Co.—Has just released lubrication plan for industry. Plan is entitled "Save and Serve" and includes lubrication manuals, wall charts, folders, posters, technical booklets. Purpose of plan to help industry save vital equipment, labor and time through sound lubrication service.

174 AIR-COOLED ENGINES

Wisconsin Motor Corp.—8-page Booklet, entitled "Harnessing Air to Industry's Vital Needs" . . . presenting typical application examples of "air and work" . . . featuring Wisconsin Heavy-Duty air-cooled engines. Contains condensed specifications of complete lines of Wisconsin engines, ranging from 1.2 hp. to 31 hp.

175 FLOW METERS, REGULATORS, CONTROLLERS, ETC.

Republic Flow Meters Co.—A 16-page illustrated general Catalog No. 43-1, describes and illustrates the complete line of Republic products, including various types of meters for flow, pressure, level and temperature of steam, water, gas, air, oil and other fluids; CO_2 meters; pneumatic remote measurement and control systems; regulators; automatic combustion controls; water level and pump controls; pressure reducing and desuperheating systems.

176 CHAIN GRATE STOKERS

Illinois Stoker Co.—Catalog on Illinois-Pacific Chain Grate Heating Unit describes a specially designed heating boiler fired by a forced draft chain grate stoker. Units are built in standard sizes, and the catalog contains complete dimensions and rating tables. Special features are: high efficiency, low head room requirements and low power consumption.

177 STEAM BOILERS

Foster Wheeler Corp.—S-A Boiler Catalog, Bulletin B-44-5-M., an interesting booklet on the S-A type boiler, consisting of an assemblage of drawings and photographs, together with operating data at a number of well known plants. Method of operation, ability to fire two or three different fuels simultaneously are given; also numerous photographs showing close-up details of construction. An extended and simplified chart, giving the heat content of steam on a large scale, occupying two pages will also be found very helpful. Size 8½" × 11", 28 pages and cover, drawings and halftones.

178 DRAWING INK

Higgins Ink Co.—Hand colored card showing 18 colors of Higgins American Drawing Ink actually applied to white drawing paper.

179 CENTRIFUGAL COMPRESSORS

B. F. Sturtevant Co.—Catalog No. 386-2 describes a compact centrifugal type compressor adapted to a wide range of industrial uses. Efficiency, quiet operation, simplicity of construction are features. More than 200 sizes ranging from ½ to 1½ lb. pressure, volumes to 5,400 cfm. Catalog is illustrated with unit and installation photos, contains performance and dimension data.

180 STEAM DISTRIBUTION EQUIPMENT

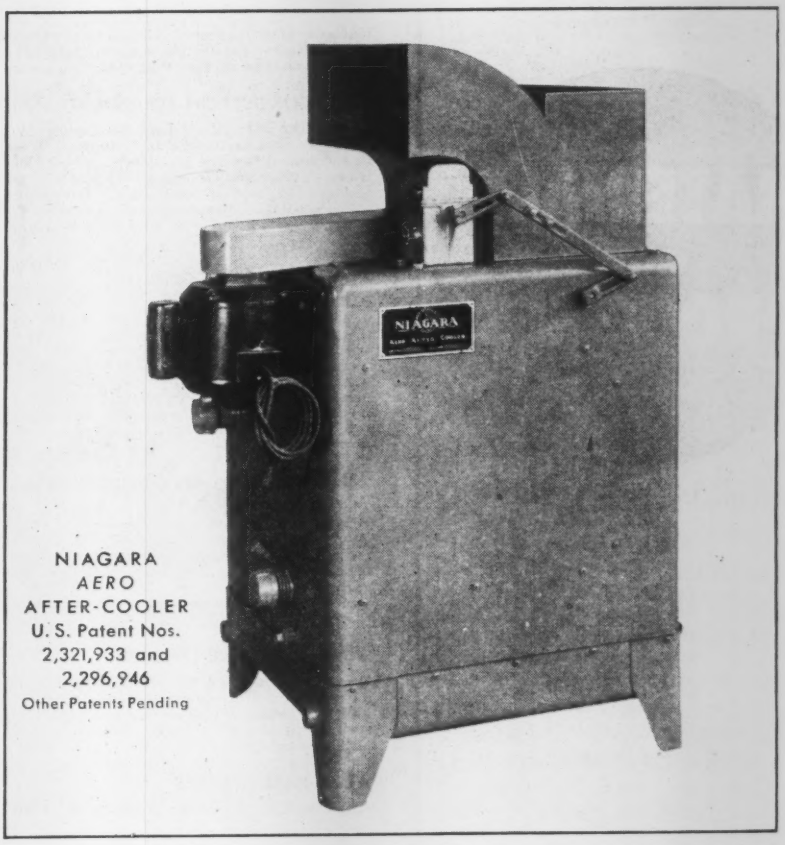
American District Steam Co.—Several revised Bulletins which are included in their latest "Adsco" Catalog No. 35 containing over 136 pages illustrating and describing their complete line of expansion joints, conduit for underground pipe lines, condensation and steam flow meters, pipe supports, saddle plates, water heaters, steam traps, etc.

181 CLAY AND ROCK REMOVAL

McLanahan & Stone Corp.—Latest Bulletin, WLO 171, fully illustrating and describing most modern and efficient McLanahan Patented Steel Log-Washer for removing tough clay and soft rock. Each welded log is driven separately by gears, shafts and bearings enclosed in safety housing and running in oil. Has reversible and interchangeable paddles. Large capacity—longer life—efficiency in operation—low up-keep, power and labor costs.

Continued on Page 44

Keeping Water and Oil Out of COMPRESSED AIR



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CATALOG BRIEFS

182 VACUUM PUMPS

Schutte & Koerting Co.—New edition of Bulletin 5-EH describes Single and Multi-Stage Steam-Jet Vacuum Pumps. Of particular interest are the Corrosion Resisting Vacuum Pumps of Haveg and Karbate construction. The bulletin also contains a comparative performance curve to aid in selecting the proper type of vacuum pump.

183 COMBUSTION EQUIPMENT

L. J. Wing Mfg. Co.—Bulletin Co-5.—Wing Axial Flow Blowers for forced and induced draft. Illustrated and described are Model EMD Single Stage Blower for capacities up to 4″ static pressure and 35,000 cfm. and Model COM, Two-Stage Blower with built-in volume control, for capacities of 40 static pressure and over and volumes up to 50,00″ cfm.

184 CONTOUR CONTROL

Bailey Meter Co.—Bulletin No. CC1 describes a new contour control which employs the principle of the precision air measuring gage to obtain extreme accuracy in the automatic operation of machine tools. This control employs a pneumatic system which scans a thin metal templet and controls powerful hydraulic cylinders which accurately position the cutting tool. Its accuracy of repetition is within .0002 inches and a smooth stepless finish is produced.

185 SUPER-SENSITIVE DRILLING MACHINES

The Hamilton Tool Co.—A series of illustrated Brochures is available describing their line of "Portelvator," elevating portable table for tool rooms, machine shops and punch press rooms and other uses; Hamilton Supersensitive drilling machines for small holes .004″ to .250″ diameter which are now more important because they help save on small drills.

186 GASOLINE ENGINES

Briggs & Stratton Corp.—New literature describing current line of single cylinder, 4-cycle, air-cooled, gasoline engines—capacities 1½ to 6 H.P. Describes principle features, dimensions and other engineering data.

187 PISTON RINGS

Koppers Co., American Hammered Piston Div.—Leaflet describing types of automobile piston rings which should be used to restore motor performance effected by various cylinder wear conditions. Combinations of specialized compression and oil rings are recommended in the leaflet, for varying degrees of cylinder wear, with and without their reboring. Operation of a Kowtherizing machine, for correcting "slap" by resizing pistons to their original diameter, is also described and illustrated.

188 FIRE BRICK, CEMENT, ETC.

Laclede-Christy Clay Products Co.—Have prepared a 6-page Chart which gives engineering information and uses for their line of refractories and refractory specialties. It covers high temperature cements, coatings, fire brick, plastic fire brick and insulating brick.

189 UNIT SUSPENDED WALLS

Bigelow-Liptak Co.—Latest Catalog describes the advantages of unit suspended furnace walls over solid masonry construction and the principles of Bigelow-Liptak construction. Fully illustrated with charts, tables, detailed construction photographs and pictures of actual installations.

190 FLEXIBLE METALLIC TUBING

Titeflex, Inc.—New Catalog, No. 113, deals with the general industrial applications of their line of flexible metallic tubing. This catalog describes the types of flexible tubing used in the conveyance of oils, gases, and liquids. Complete data is given on available fittings, both industrial and S.A.E. Also included are complete pressure charts, charts showing radius of bend, and much other essential data. Many usual and unusual types of applications for flexible metal tubing are pictured and described, together with instructions for installation of the tubing. This catalog should be particularly valuable to design engineers, power engineers, maintenance executives, and production executives in metal working and process industries.

191 REGULATING VALVES

Anthony Co.—Bulletin R showing their Regulating Valves designed for accurate control of liquid, steam, gas and air flows at pressures up to 250 lbs. A combination regulator and shut-off valve. Specially adapted for oil burners.

192 TECHNICAL BOOKS

John Wiley & Sons—Complete Catalog, 252 pages, describing over 1,200 volumes on all phases of science, mathematics and engineering. Circulars are available on books just issued, as: Newman: "Modern Turbines;" Barnes: "Work Methods Manual;" Young: "Materials and Processes;" Forbes: "Lubricants and Cutting Oils for Machine Tools;" Forbes: "Lubrication of Industrial and Marine Machinery;" Crane: "Plastic Working of Metals and Non-Metallic Materials in Presses."

193 ENGINE GOVERNORS

Pierce Governor Co.—New general Catalog of Pierce Flyball Governors, for gas, gasoline, and diesel engines has recently been completed and is ready for delivery. The varied functions and applications of governors in industrial, automotive, and marine operations are adequately described. A helpful piece for all mechanical engineers.

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RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

CATALOG BRIEFS . . . LATEST INDUSTRIAL LITERATURE

194 WATER TREATMENT

Permutit Co.—Completely revised and more inclusive Data Book on water treatment. 64 pages and contains 78 sections of data in addition to 36 tables and 10 graphs. It has hundreds of chemical conversions and equations. It gives methods of calculation of water conditioning problems and should be in the library of every engineer or chemist who comes in contact with water treatment.

195 WIRE COVERING MACHINE

Fidelity Machine Co.—Folder on their new high speed Triple-Head Wire Covering Machine. Knits one, two, or three coverings of yarn over solid or stranded wire in one operation. Speed 1500 feet per hour. Complete with one HP motor, stop motions, haul-off reel.

196 ELECTRIC MOTORS

Fairbanks, Morse & Co.—16-page Bulletin No. 1160 descriptive of the new Fairbanks-Morse Protected Polyphase Squirrel-Cage Motor. This bulletin is profusely illustrated, showing features of this motor including the protected frame construction, cartridge type ball bearings, centrifugally cast Copperspun Rotor, and unique conduit box which provides several assemblies as well as many other features. Several pages in the back of the bulletin give complete dimensions, frame sizes, and all motor characteristics.

197 WATER GAGES

Ernst Water Column & Gage Co.—Catalog M-2 illustrates and fully describes the Ernst "Split-Gland" Water Gage, which saves 80% changing time and makes gage glasses last longer. No wrenches are needed, no protracted struggle with "frozen" nuts. Upper and lower valves are interchangeable so that gage glasses can be set to right or left of valve bodies.

198 DROP FORGINGS

Drop Forging Association—Drop Forging Topics: Published ten times a year, "Topics" has geared its editorial policy to meet the need for additional information and practical working facts on materials, shapes, tolerances, rules for draft angles, grain flow, and testing and inspection of impression die forgings. Current issues are devoted to testing and inspection and presentation of illustrations of examples of grain flow and technical information about how it is obtained in parts produced by closed die forging process. Each issue 8 pages.

199 ELEVATED WATER TANKS

Chicago Bridge & Iron Co.—20-page Bulletin, "Radial-cone Bottom Elevated Water Tanks," explains the advantages of modern elevated water storage. It contains illustrations bringing out the various architectural treatments of the specially designed elevated water tanks with a low range in head. These illustrations depict tanks with capacities from 200,000 gal. to 1,500,000 gal. from every section of the United States.

200 FLEXIBLE SHAFT COUPLINGS

Diamond Chain & Mfg. Co.—Flexible Shaft Couplings are described in the revised edition Bulletin No. 12. The advantages of this type of Diamond Double Roller Chain Coupling are explained and many applications shown. Horsepower rating and dimensions as well as enclosing casing dimensions and weights are given with prices for both Couplings and Casings.

201 CENTRIFUGAL PUMPS

American-Marsh Pumps, Inc.—Bulletin No. 461 which describes Centrifugal Pumps designed for the handling of petroleum products and chemicals having operating temperatures as high as 350° F. Available in several sizes for capacities up to 1200 GPM against 350 lb. pressure. These units have 13 important new features making them particularly suitable for the handling of materials requiring special pumping equipment. Also available in similar construction are types designed for temperatures as high as 800° F (Bulletin No. 460).

202 CHAIN DRIVES

Morse Chain Co.—"Morse Silent Chain Drives, Bulletin 43" has just been released. Completely revised and rewritten, this new publication presents the subject of drive selection from an entirely new angle based on up to the minute high speed design practice. Probably the most complete hand-book yet produced on the subject of silent chain drives, the edition is necessarily limited in quantity.

203 MINE PUMPS

Pomona Pump Div., Joshua Hendy Iron Works—Bulletin No. 27, especially designed for use in dewatering mines and in keeping workings dry; as boosters; sponges; for brine or sulphur handling; mine or mill water supply. Capacities to 10,000 G.P.M.; pressures to 800 P.S.I.; fluid temperatures to 180° F.

204 TOOL GRINDERS

K. O. Lee Co.—Latest Catalog fully illustrating and describing the "Knock-Out" Universal Tool Grinder. Because of original ingenious design of the machine itself as well as the fixtures, the set-up time on most jobs is greatly reduced. It is a production machine as well as a tool grinder.

205 REFRACTORIES

The Carborundum Co.—New Booklet "'Carbofrax' Refractory Skid Rails" provides detailed descriptions and drawings of many typical installations. It provides also helpful data on "Carbofrax" skid rail characteristics, functions and applications. This information will be of valuable assistance to operators of heating furnaces.

206 LEATHER BELTING

J. E. Rhoads & Sons—Revised edition of Tannate Handbook. The purpose of this handbook is to help you with your belting problems and to show general applications which can be handled most satisfactorily with "Tannate" Watershed Flat Leather Belting. It contains the results of their long experience as belting manufacturers.

207 CUTTING OILS

D. A. Stuart Oil Co.—"Soluble Cutting Oil at Its Best" is the title of a 20-page Booklet which discusses typical problems involved in the selection and application of water-mix oils. Among the articles included are "By What Yardstick Do You Measure the Ideal Soluble Oil?" "Antiseptics in Soluble Oils" and "Where Can I Use Soluble Oil?" Another helpful article tells how to mix soluble oils for best results. The booklet is liberally illustrated with photographs of machining operations and laboratory tests.

Continued on Page 46

Eliminate EXPLOSION HAZARDS

In many manufacturing operations, air combining with vapors or dust from dryers, pulverizers, grinders, or mixers results in a combustible and highly explosive mixture. This dangerous condition can be prevented by the use of INERT GAS produced with a Roots-Connersville Inert Gas Generator. Also extensively used for agitating inflammable liquids in processing operations, and purging gas handling equipment. Complete information in Bulletin 100-B14—Write for it.

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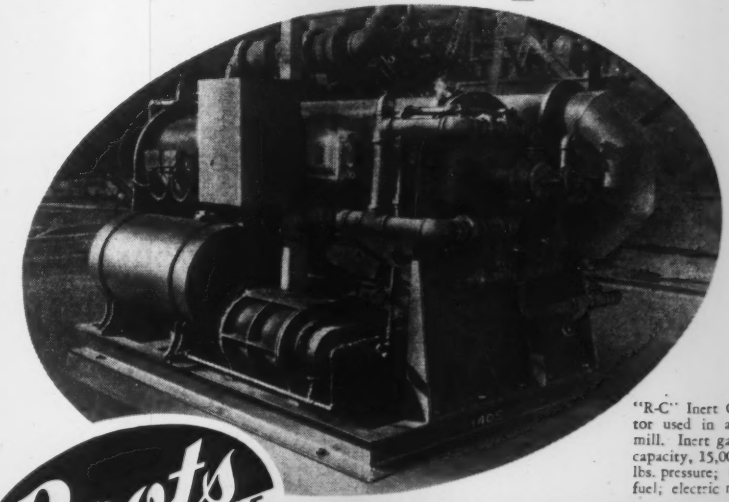


"R-C" Inert Gas Generator used in a large steel mill. Inert gas producing capacity, 15,000 c.f.h.; 2 lbs. pressure; using oil for fuel; electric motor drive.

Roots CONNERSVILLE SINCE 1854

Inert Gas GENERATORS

★ PRODUCE, SHARE, and PLAY SQUARE WITH FOOD ★

CATALOG BRIEFS . . . LATEST INDUSTRIAL LITERATURE

208 MECHANICAL SPRINGS

Associated Spring Corporation—Divisions: Wallace Barnes Co.—Barnes-Gibson-Raymond—F. W. Manross & Sons—William D. Gibson Co.—Raymond Manufacturing Co.—Dunbar Brothers—Wallace Barnes Co., Ltd. (Canada)—Newly published Handbook, "Mechanical Springs—Their Engineering and Design." In the book are presented various charts and formulas upon which the design of all types of Mechanical Springs is currently based. The material represents the experience, research and knowledge of the combined engineering forces of all of the Divisions of the Associated Spring Corporation in this country and Canada.

209 ROLLING MILLS

Standard Machinery Co.—"Standard" Rolling Mills of all sizes and types for hot and cold rolling of strip, rod and ingot are offered in new Catalog Section RM. These mills are built to meet specific customer requirements—Two High for sizing and embossing—Three High for rolling strip or reducing ingots—Four High Precision Mills for extremely close tolerances.

210 QUALITY DROP AND UPSET FORGINGS

McKaig-Hatch, Inc.—Specialize in Drop and Upset Forgings both rough and machined. Methods employed save material and considerable time in machining operations. Show a line of forgings which illustrate the saving effected through their forging and upset methods, also quality of products achieved.

211 TRIPLEX AND QUINTUPLEX PUMPS

Aldrich Pump Co.—An unusually useful 28-page Handbook of Hydraulic Tables and engineering data. Contains capacity tables of single-acting triplex and quintuplex pumps, friction loss tables, theoretical discharge from nozzles of various diameters, saturated and superheated steam tables, lists of materials for pumping various liquids, etc. Size 8½ x 11, varnished cover, punched for binding in standard 3-post binder.

212 COMBINATION PULVERIZER COAL AND OIL BURNING

Engineer Co.—New Bulletin entitled "Enco Fuel Oil Atomizers and Electric Ignition Systems for all types of Pulverized Coal Burners." This new bulletin explains the adaptability of Pulverized Coal Burners for oil firing and some of the many advantages. Gives an illustrated description of the Enco Oil Atomizers, the relative merits of steam or mechanical atomizers and their application to various types and makes of Pulverized Coal Burners. Also describes an Oil-electric Ignition System by remote control.

213 SPRING-LOCK FASTENERS

Elastic Stop Nut Corp. of Amer.—36-page Catalog on spring-lock fasteners for aircraft and other equipment requiring an easily operated device for quick removal and replacement of plates, access covers, and hinged elements. Contains complete engineering data, test results, government approvals and suggestions for post-war applications.

214 TACHOMETERS

Boulin Instrument Corp.—Two 4-page illustrated Bulletins describe the Strobomeca, a Stroboscopic Hand Tachometer for measurement of rotary and vibratory speeds from a distance and without contact with the rotating or vibrating objective. Made in two basic ranges 500–8000 and 1000–16,000 the use of multiples permits speed measurements from 10 RPM to 100,000 RPM and more. The Strobomeca is not affected by temperature, magnetic fields and humidity is accurate within +/−2%.

215 FLUID FUEL BURNING EQUIPMENT

Todd Shipyards Corp. (Combustion Equipment Div.)—A complete line of Catalogs covering over fifty different types of equipment for boilers 60 H.P. or above both high and low pressure, also special combustion applications. No general catalog available. Send outline of problem for catalogs and details applicable to the particular case at hand.

216 PLASTICS

Bakelite Corp. and Plastics Div. of Carbide and Carbon Chemicals Corp.—Physical properties of Plastics—This 48-page Booklet describes, by means of case histories, several types of "Bakelite" and "Vinylite" plastics that offer outstanding resistance to wear in addition to other properties. While not providing complete material for a research program, this booklet will serve as a guide to the research man's selection of a plastic for use where wear and abrasive resistance or hardness are important factors. This booklet is the third in a series of research guides dealing with the various types of "Bakelite" and "Vinylite" plastics.

217 GEAR-SPEED REDUCERS, CUT GEARS

D. O. James Mfg. Co.—Gear-Speed Reducer and Cut Gear Catalog No. 1000R, 378 pps., liberally illustrated reference volume. Covers Herringbone, Planetary, Spiral Bevel, Spiral Bevel Herringbone and Planetary, Worm and Motorized Reducers and Couplings. Complete application information; specifications, selection and service factors, ratings, loads, dimensions, ordering and quotation data, tables, curves, etc. See Mechanical Catalog, pps. 161–164.

218 SHAPERS, PLANERS, SLOTTERS

Rockford Machine Tool Co.—Portfolio of 8 Bulletins on Hy-Draulic Shapers, Planers, Slotters and Shaper-Planers. Pictures, describes and discusses design, construction and operating features, details and specifications as advertised, page 260, A.S.M.E. Mechanical Catalog and Directory.

219 MALLEABLE IRON VALVES

Jenkins Bros.—6-page brochure describing the new line of Air Furnace Malleable Iron gate, globe, angle, and check valves by Jenkins Bros. Valves recommended for 150 lb. steam pressure at 450° F., where severe service conditions are encountered.

220 AXIAL FLOW FANS

La-Del Conveyor & Manufacturing Co.—16 pps. Bulletin No. 116. Explains and illustrates novel features and principles of La-Del Axial Flow Fans applied to mining and related industries. Charts, tables, ratings, illustrations enable engineers to project highly efficient applications in many industries for exhausting, ventilating, coaling, etc.

221 PIPE TOOLS

Beaver Pipe Tools, Inc.—New Catalog No. 44, 48 pages of practical information, production operating data, specifications on Pipe and Bolt Machines, Portable Electric Power Units, cutters, threaders, reamers for bolts, pipe, tubing for grooving or beveling pipe before welding. Covers complete line of pipe tools supplies and accessories. See our advertisement, A.S.M.E. Mechanical Catalog & Directory, page 55.

222 PUMPS FOR CHEMICAL SERVICE

Buffalo Pumps, Inc.—Engineers concerned with the operation of Chemical plants will find Bulletin No. 982 of considerable interest. This deals with pumps for chemical service, lead, alloy, rubber-lined, etc.; includes pages of data on materials most suitable for handling various liquids, and general notes on application and selection of pumps.

223 AXIAL FLOW FANS

Buffalo Forge Co.—New Axial-Flow Fan Bulletin No. 3229-B which covers the development of Axial Flow Fans, their application to marine, aviation and other war markets, and also their industrial and commercial use. Comparison curve of axial and centrifugal types is interesting, suggesting that care must be taken to select the fan most suitable to conditions.

224 CRANES, HOISTS, ELEVATORS, ETC.

Detroit Hoist & Machine Co.—Catalog No. 40, 48 pages. Well illustrated, electric and pneumatic cranes, hoists, elevators, tiering machines, winches, trolleys, turntable tractors, controllers, switches. Shows applications in many industries, yards, docks, ice plants, warehouses, foundries. Capacities, dimensions, weights, etc. Also portfolio of specification bulletins. See page 98, A.S.M.E. Mechanical Catalog for our advertisement.

225 SPECIAL MACHINERY

Epworth Mfg. Co.—Catalog of Special Machinery designed and built to suit special jobs—Custom-built factory production machinery—such as paint and chemical manufacturing machinery, special machinery for the steel industry, Special Hydraulic Presses, etc.

226 SELF-POWERED HEATERS AND VENTILATORS

Herman Nelson Corp.—Self-Powered Heaters and Ventilators for use when portability is necessary. Direct fired, gasoline burning units, powered by gasoline engine or electric motor. Canvas duct arrangements for attaching to heaters and ventilators are collapsible. Also literature on steam unit heaters, propeller fans and blowers. Also see page 227, A.S.M.E. Mechanical Catalog and Directory.

227 QUENCH COOLERS

York Corp.—Bulletin describing York Quench (Evaporative Liquid) Coolers, designed to cool liquids for a wide variety of heat-removal processes and the apparatus is particularly suited to quench liquid cooling (oil, water or other liquids) where the temperature requirements of the quench liquid are generally between 100° minimum to 160° F. maximum. These units are especially applicable where requirements call for cooling of Diesel or gas engine jacket water, transformer oils, cutting oils and engine lubricating oils.

228 AIR PREHEATERS

Air Preheater Corp.—"High Efficiency Heat Recovery for Power Plants, Oil Refinery Heaters, Industrial Furnaces." Four-page illustrated Bulletin tells how the Ljungstrom principle saves fuel, steel and space. Describes mechanical features, lists recent installations.

229 MULTITHERM UNITS

Clarage Fan Co.—Bulletin No. 107, Clarage Multitherm Units for vital, war-time industrial air conditioning services. Types to furnish cooling only, heating only, or year-round control of temperature and humidity, quickly installed—no building alterations or elaborate duct system required. Widely used to speed war production. Large range of sizes.

Read the various items listed . . . one catalog may hold the solution to your present problem . . . and select those of interest to you. Distribution by us to students is not included. The coupon on page 31 should be mailed promptly. It must reach us on or before June 10th as none will be filled after that date.

CATALOG BRIEFS

230 CASTERS, WHEELS, GLIDES

Darnell Corp.—New 192-page Darnell Caster and Wheel Manual is a complete data book covering nearly 4000 different models of light, medium and heavy duty casters and wheels. Whatever your requirements, this informative manual recommends a specific type of caster or wheel that has been developed to do the job more efficiently.

231 PUMPS

Economy Pumps, Inc.—1944, 256-page Pump Data Book contains important information to executives, plant managers, maintenance men, etc. Contents include data on pump installation, pump operation, operating costs, determination of pump capacities, etc.

232 PNEUMATIC MARINE CONTROL SYSTEMS

Westinghouse Air Brake Co.—Catalog IDA 9471-2. Describes new applications of Pneumatic Controls on Marine Diesel engines, rudder control for river and harbor vessels, searchlight training and auxiliary control of blowers, fire pumps, etc. Complete speed regulation and maneuvering functions of Diesel engines—starting, stopping and reversing—centralized under "finger tip" controls. Interlockings insure correct operating sequences.

233 SKIP HOIST LOADING GATE

C. O. Bartlett & Snow Co.—Bulletin No. 92, just released, describes the company's new Plug Feed Type Skip Hoist Loading Gate. The bulletin has "progress photographs," showing how arms on the skip bucket release a latch on the gate, permitting the self-damming feed chute to be lowered into the position on rollers—and returned to latched position when the skip bucket is raised—avoiding friction—and wear—noise and spillage, even with quite high speeds of bucket travel. The folder is complete with detailed engineering diagrams and a table giving the dimensions of eleven standard sizes.

234 POWER OPERATED CHUCKS

Logansport Machine Co.—Section 1, Catalog 70, describes the complete line of "Logan" American Standard Power Operated Chucks, including 2 and 3 Jaw Universal, Combination and Serated Checks, 2 in 1 Universal and Combination Chucks, 2 and 3 Jaw Compensating Chucks and Chucks for special service. Complete dimensions and detailed engineering data are given, including instructions for installation and operating.

235 STEAM TURBINES

Murray Iron Works Co.—Murray Type "U" Single Stage Turbines for Mechanical Drive described in Bulletin T-118. Many hundreds of these units are in particularly successful operation due to advanced design features and materials of construction. Recent installations include a large number operating at high back pressures of from 100# to 250#.

236 INDUSTRIAL VACUUM CLEANERS

Spencer Turbine Co.—Bulletin 130, 4 pages, new attractive bulletin describes the new Spencer Sump-Vac, a portable vacuum producer which cleans machine sump tanks in 2 to 10 minutes as compared with half an hour with former methods. The Sump-Vac has a capacity of 125 gallons—enough for 3 to 5 sumps. The bulletin also briefly describes applications of Spencer industrial vacuum cleaners and turbo-compressors, in ordinary and special cleaning and as an aid to countless industrial processes.

237 STEAM SPECIALTIES

Williams Gauge Co.—Catalog No. 442 just issued, describes their complete line of Power Plant Equipment. This new 24-page illustrated catalog contains technical data on Williams pump valves, water gauges, steam pump governors, gauge cocks, ball type high pressure steam traps, safety feed water regulators, high and low alarm columns, flanged silent check valves and standard feed regulators.

238 NICKEL AND NICKEL ALLOYS

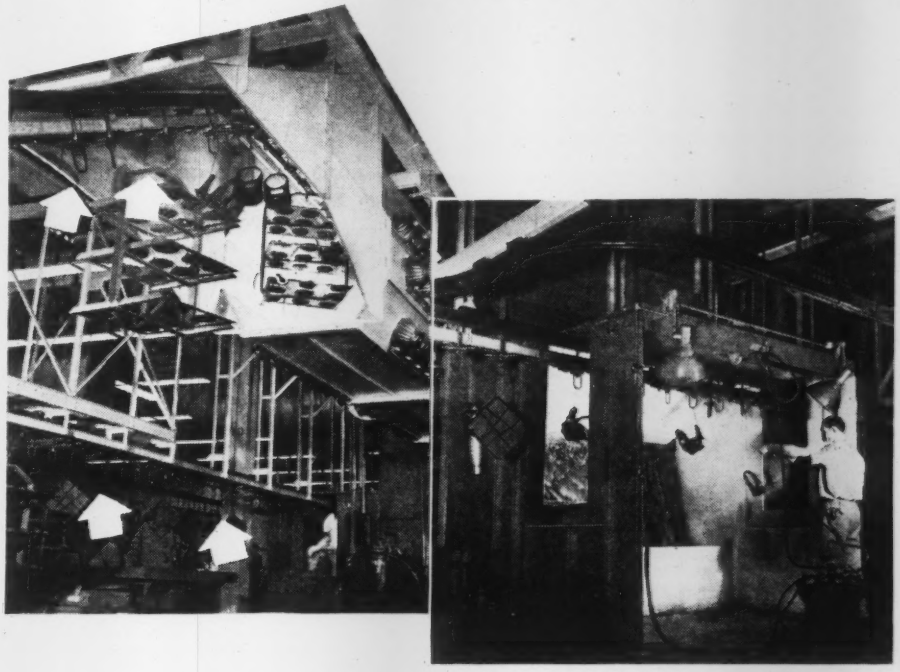
International Nickel Co.—"The Technical Editor Speaks"—a new 24-page Booklet explains the practical meanings of technical terms used in measuring the mechanical properties of metals and alloys. Describes the tests for measuring the properties of metals and explains how metals and alloys are judged by their properties.

239 SPEED REDUCERS AND GEARS

Foote Bros. Gear & Machine Corp.—Catalog 204-E Gear Problems: This is a comprehensive 663-page general catalog covering complete information on their lines of spur, worm and helical speed reducers, including rating tables, dimensions, application information and views of installations in various industries. It includes also complete descriptions

Continued on Page 48

PLANNED CONVEYING
–Cuts Work Travel
–Permits Processing in Transit



In designing new plants or converting existing ones, control of work flow is a key objective. Here, planning can pay dividends to the engineer who makes the right decisions on conveyors and their location as related to plant operations. Manpower loads are lightened, savings in time and space effected, when the right material handling equipment becomes an essential link in a chain of processes.

A case history example of planned conveying is the new Long Island plant of a well-known maker of precision instrument parts. Its finishing department, shown above, is located for a minimum of work travel. Its Gifford-Wood Overhead Conveyor System permits continuous processing of units in transit, saving production time and floor space. (See picture at right.)

GIFFORD-WOOD OFFERS ADVISORY SERVICE AS WELL AS CONVEYOR SYSTEMS

In the plant shown above, and in others in a wide range of industries, Gifford-Wood engineers worked with the factory engineers and designers in making material handling equipment part of the original plans. As a result, greater production per worker is achieved.

Such stepped-up output cuts costs, and will help in putting converted plants in better competitive position after the war. Thorough experience in varied processing developments . . . first-hand knowledge in meeting material-handling needs in many industries . . . these give added authority to Gifford-Wood's advice on Planned Conveying.

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Ash Spouts • Barge Unloading • Bins • Boiler House Equipment • Buckets • Bunkers • Carriers Chutes • Conveyors • Crushers • Elevators • Feeders • Gates • Ground Storage Systems • Hoists Hoppers • Infra-Red Drying Systems • Screens • Silo Storage Plants • Tanks • Weigh Larries

5757

IMO OIL PUMPS
for BATTLE Dependability

A cruiser of the U. S. Navy, one of the classes of ships equipped with De Laval-IMO oil pumps

On fighting ships, where reliability and dependability under strain are all important and where space is at a premium, many thousand IMO oil pumps are in use pumping fuel oil, circulating lubricating oils, and operating hydraulic machinery. The simplicity of construction and operation that makes the IMO pump so dependable in battle assures the commercial user of long life and trouble-free operation. This unique pump has practically nothing to get out of order; it has only three moving parts, and no pilot gears or valves.
Write for Leaflet 1-117.

IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton 2, New Jersey

IRVING GRATING PRODUCTS

Open Steel Floors and Treads
"A Fitting Grating for Every Purpose"

IRVING SUBWAY GRATING
Pipe Trench Cover and Partition

Truck wheels roll smoothly on this grating. Panels are easily removed for access to pipes and valves below.
Grating partitions permit air circulation, visibility and protection to stock rooms and special tools and machinery.

Catalog for the asking.

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WESTERN DIVISION: FOOT OF PARK AVENUE
EMERYVILLE 8, CALIFORNIA

CATALOG BRIEFS

of the various types of gears and 200 pages of general engineering information on mechanical engineering subjects with formulae, tables, and data, making it a very valuable reference book.

240 ROTARY PUMPS

Tuthill Pump Co.—Tuthill's General Catalog features technical and performance data on complete line of positive displacement, internal-gear rotary pumps—for coolant, lubrication, fuel oil delivery, liquid transfer and hydraulic services. Capacities from 1 to 200 g.p.m. and pressures to 400 p.s.i. automatic reversing and internal bypassing types. Also "stripped" models.

241 AUTOMATIC CONTROL INSTRUMENTS

McAlear Mfg. Co.—New 191-page Catalog lists more than 500 control instruments for regulating pressure, flow, liquid level and temperature. Gives pressure and temperature ranges for each device in service with steam, water, oil and gas. Explains application of instruments in process industries, refineries, chemical and power plants. 14 pages of valuable engineering data and charts.

242 STEAM BOILERS

Bigelow Co.—Complete Catalog of their various types of Water Tube and Fire Tube Steam Boilers. The Bigelow Three-Drum Bent Tube Boiler can now be furnished with furnace water cooling designed to eliminate the complicated conventional system of outside headers and circulators. All water wall tubes are connected to boiler drums in the same manner as the boiler tubes proper, and therefore are in the same circulatory system.

243 PUMPS

Blackmer Pump Co.—Hydraulic Engineering Data Bulletin 303, 24 pps. Tabular data: viscosities of various liquids, conversion factors, pipe frictions, valve and fittings flow resistances, standard corrosion resistant materials for various liquids, head and pressure equivalents, pumping power requirements and much other necessary practical pump engineering data.

244 ELECTRIC HEATING SYSTEM

Hynes Electric Heating Co.—Bulletin #14 describes an improved type of electric heating system for circulating oils and fluids built for use in preheating lubricating oils before centrifuging and also for hot oil heat transfer processes in connection with industrial kettles and tanks. All live electrical parts are sealed from oil or moisture and explosion proof designs are available where necessary.

245 REGULATORS

Spence Engineering Co.—New Catalog describing and illustrating in detail the Spence line of Regulators which illustrates fully the principle of the Spence design, wherein one self-contained main valve—single seated, normally closed, balanced metal diaphragm, packless—can be controlled by various types of interchangeable Pilot Valves to regulate pressure, to regulate temperature, to regulate differential, to control pumps, to retain pressure, to regulate liquid levels, or to be electrically controlled. Two or more of these Pilots can be connected to a Main Valve to serve a Multiple purpose, such as a combination regulator to control both temperature and pressure.

246 FLEXIBLE METALLIC TUBING

Pennsylvania Flexible Metallic Tubing Co.—New Bulletin, now in preparation, describes "Penflexweld" jointless, corrugated, flexible metallic tubing —sizes $^{5}/_{32}$" to 2" in plain, braided or protective sleeve types, in steel or bronze, for applications in machine, design. Other "Penflexweld" data in Bulletin 90 and Bulletin 71.

247 CRANE AND HOIST MAINTENANCE

Shepard Niles Crane & Hoist Corp.—104-page illustrated "Maintenance and Operation Manual" shows how to maintain material handling equipment in perfect operating condition—sectional photos and line drawings list parts of cranes and hoists, and text explains correct maintenance procedure—manual is compiled for operating men responsible for servicing cranes and hoists—all phases are covered.

248 COUNTING SCALES

Toledo Scale Co.—New illustrated and descriptive 28-page Booklet on Toledo Counting Scales. Contains helpful suggestions on choosing models for various uses in production and stock control. Describes importance in accounting and manufacturing accuracy. A wide variety of models carefully illustrated to show specifications and actual applications.

249 HEAT EXCHANGERS

Downingtown Iron Works, Heat Transfer Div.—Complete Catalog and Data Book on Heat Exchangers with photographs, diagrams, sectional views and dimensions. Typical uses include lubricating-oil cooler, jacket-water cooler, vapor condenser, aftercooler, gas cooler and many other general process duties.

250 ROTARY COMPRESSORS, PRESSURE BLOWERS AND VACUUM PUMPS

Lammert & Mann Co.—Bulletins illustrate and describe improved Lammert rotary vacuum pump, vibrationless, quiet, no valves or reciprocating parts, no tanks or receivers necessary for either vacuum or pressure, uncontaminated lubrication system; also compressors and pressure blowers. Tables show types, duty, sizes and capacities specifications. See A.S.M.E. Mechanical Catalog & Directory, page 186.

251 PRESSURE CONTROLLERS

Hanlon-Waters, Inc.—Bulletin No. 101, 12 pages, describes Type 1400 Pressure Controller for installation where controller operation makes for greater sensitivity and smoother control. Contains colored flow chart. Views of typical installation. Adjustable, without change of construction for "snap" action. Bourdon test actuated.

252 ELECTRONIC HEATERS

General Electric Co.—Electronic heaters for heating metals are featured in a new, illustrated 8-page Bulletin (GEA-4076) recently issued. The publication describes the electronic method of heating metals, emphasizes its simplicity, and gives in detail the specifications of both the 5-Kw and the 15-Kw, 550-kilocycle electronic heaters. Also included in the bulletin are illustrations of many important small parts which may be brazed, soldered, or surface hardened by electronic heating.

COMING MEETINGS AND EXPOSITIONS

During the next three months

MAY

1–2	American Mining Congress, Coal Mine War Conference, Cincinnati, Ohio
14–16	American Institute of Chemical Engineers, 36th Semi-Annual Meeting, Hotel Cleveland, Cleveland, Ohio
17–18	Society of Automotive Engineers, National Diesel F. & L. Meeting, Hotel Knickerbocker, Chicago, Ill.
17–18	Society for the Advancement of Management, Hotel Statler, Washington, D. C.
22–24	American Gear Manufacturers Association, Westchester Country Club, Rye, N. Y.
24–25	American Management Association, Insurance Conference, Hotel New Yorker, New York, N. Y.
25	American Iron and Steel Institute, Waldorf-Astoria Hotel, New York, N. Y.

JUNE

5–7	Society of Automotive Engineers, National War Materiel Meeting, Book-Cadillac Hotel, Detroit, Mich.
5–7	American Society of Refrigerating Engineers, William Penn Hotel, Pittsburgh, Pa.
19–21	American Society of Agricultural Engineers, Annual Meeting, Schroeder Hotel, Milwaukee, Wis.
19–22	The American Society of Mechanical Engineers, Semi-Annual Meeting, William Penn Hotel, Pittsburgh, Pa.
21–22	National District Heating Association, Annual Meeting, William Penn Hotel, Pittsburgh, Pa.
22–25	Society for the Promotion of Engineering Education, Netherlands Plaza Hotel, Cincinnati, O.
26–30	American Institute of Electrical Engineers, Summer Technical Meeting, Jefferson Hotel, St. Louis, Mo.

JULY

19–21	American Society of Civil Engineers, Annual Convention, Hotel Cleveland, Cleveland, Ohio

For Calendar of coming A.S.M.E. Meetings see page 353 in the editorial section.

CATALOG BRIEFS . . . LATEST INDUSTRIAL LITERATURE

253 STORAGE BATTERIES

Thomas A. Edison, Inc.—"Modern Material Handling" is the title of a 24-page illustrated Booklet describing the tractor-trailer system, the skid-lift-truck system, the pallet-fork-truck system, and various special industrial truck handling systems. Also contains information as to methods of exchanging batteries to provide 24-hour daily operation, as well as electrical data and dimensions of alkaline batteries for industrial trucks.

254 VARIDRIVE MOTORS

U. S. Electrical Motors, Inc.—Interesting, profusely-colored Bulletin devoted to application of U. S. Varidrive Motors for changing speeds from 2 to 10,000 r.p.m. Also new Bulletin featuring Unimount Motors. Both bulletins describe U. S. Motor exclusive features—Asbestos-protection, use of normalized castings and Lubriflush lubrication.

255 ROTARY PUMPS

Geo. D. Roper Corp.—General Catalog covering the complete line of Roper "hydraulically balanced" pumps for transferring thick or thin liquids, coolants, and for hydraulic mechanisms. Illustrations, cut-a-way views, drawings, pumping capacity tables and complete information on pumps and pumping problems.

256 WATER SOFTENERS

Elgin Softener Corp.—New 16-page Bulletin No. 603, describes zeolite water softeners and other water conditioning equipment. Covers all types and sizes for any application. Includes a detailed description of newest type Elgin "Double Check" Zeolite Softener which gives up to 44% more capacity, prevents zeolite loss, cuts backwash and rinse water requirements and reduces salt consumption. Bulletin also tells how to increase capacity and efficiency of existing zeolite softeners. Other subjects covered are iron removal, filtration, aeration and boiler water conditioning.

257 PERMANENTLY ACCURATE TORQUE WRENCHES

P. A. Sturtevant Co.—General Catalog showing and describing (1) over 50 types and sizes of permanently accurate single and T-handle Sturtevant Torque Wrenches in capacities of from 0-40 inch ounces to 7200 inch pounds, (2) Torque Testing Equipment, (3) Spring Testers. Complete with: (4) numerous applications of torque wrenches in product control and in production, inspection and maintenance departments; also valuable engineering data.

258 CONTAINERS FOR GASES, LIQUIDS AND SOLIDS

Pressed Steel Tank Co.—A series of 2-page Bulletins describing the advantages of Hackney Containers for shippers of many types of gases, liquids and solids. These bulletins are interestingly illustrated with photographs and engineering blueprints. A comprehensive picture is given of the construction and design of Hackney Compressed Gas Cylinders, Hackney Removable Head Drums and Hackney Removable Head Barrels. Specialists in the manufacture of deep drawn shapes and shells, Pressed Steel Tank Co. can work in numerous metals (Stainless steel, Monel metal, nickel, aluminum, Herculoy, bronze, copper, various alloys, etc.).

259 ROLLER BEARINGS

McGill Manufacturing Co.—Engineering Data Book, No. ED-41 "Soli-flend" Bearings. This Data Book contains applicational information including load capacities, speed and life expectancy tables applicable to the wide range of inner and outer race combinations, and is said to be especially valuable to the designing engineer. All sizes are drawn to scale and half scale for tracing the full type roller bearings into engineering drawings.

260 POTENTIOMETER CONTROLLER

Brown Instrument Co.—Bulletin 15-A, describing the Brown Circular Chart Air-O-Line Potentiometer Controller. In this new instrument a "Continuous Balance" Unit takes the place of the galvanometer used in the conventional mechanical type potentiometer, a periodic or cyclic mechanism. This Brown Instrument brings to industry, for the first time, the ideal synchronization of measurement and control for temperature process.

261 REPAIRS TO CONCRETE FLOORS

Smooth-On Mfg. Co.—How to repair ruts, holes, and rough spots in concrete, permitting full traffic within a few hours. Folder describes Smooth-On No. 7 Quick Patch Cement, which has an iron base that provides a hard, dust-proof, oil-proof surface. Besides its slight expanding characteristic that securely wedges the patch within its confines, this Smooth-On Product becomes stronger with age, like the well-known Smooth-On No. 1 Iron Repair Cement for sealing cracks, stopping leaks, and tightening loose parts.

262 BOILER FEED MAKE-UP

The Griscom-Russell Co.—Scale-shedding Bentube Evaporator, widely used by general industrial plants, central power generating stations, and on shipboard. Bulletin 362 describes the designs which are today producing a total of more than 35,000,000 gpm of pure boiler feed make-up from every conceivable kind of raw water supply. Variety of types available for a wide range of capacities and plant requirements, with details of design and guarantees based on 74 years of specialized experience in building heat transfer apparatus.

263 MECHANICAL SPRINGS

Wickwire Spencer Steel Co.—A pocket size Booklet titled "Let's take a tour with Wick and Spen, the Wise Men," dramatizes how Wickwire Spencer Springs and other steel products enter almost every phase of living, from the time your alarm clock sounds off in the morning until you retire, including the operation of mechanical apparatus and industrial plants of all kinds.

264 FURNACE HEAT ENCLOSURES

M. H. Detrick Co.—New 80-page Catalog, Data and Textbook, on furnace design. Principles of modern construction and practical application are discussed and liberally illustrated with charts, photographs, diagrams, cross sections and typical settings. Covers chain-grate, underfeed and spreader stoker fired boilers, pulverized fuel, oil, gas and oil-fired, wood, bagasse, incinerator, cracking and oil stills, steel heating, soaking-pit, open-hearth, annealing, forging furnaces, etc.

265 ROLLER BEARINGS

Orange Roller Bearing Co.—16-page Engineering Data Book giving details of construction and

Continued on Page 450

BUILD **TUTHILL** PUMPS INTO THE DESIGN OF YOUR MACHINE . . . SAVE SPACE, MATERIAL AND MONEY

For present or post-war requirements, it will pay you to incorporate Tuthill Stripped Pumps directly into the design of your machine. These internal-gear rotary pumps are furnished without mounting bracket or without housing as pumping elements only — for coolant, lubrication, hydraulic and liquid transfer service. They save space, material and money. Capacities from 1 to 50 g.p.m. Write for Tuthill Stripped Pump bulletin.

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Pipes clogged with scale can do only half their work. Scale in cooling systems, boiler or water systems cuts down the efficiency of the pipe and costs money. Haering Organic Glucosates will remove this scale and prevent further deposition.

Write today for any of our technical booklets. Better still, a Haering Field Engineer will gladly call and study your problems without obligation.

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CATALOG BRIEFS . . . LATEST INDUSTRIAL LITERATURE

advantages of Orange Staggered Roller Bearing design, together with all dimensions, capacities, tolerances and lift expectancies in simplified, easy-to-read form. Also contains drawings of typical applications.

266 HYDRAULIC PRESSES

Hydropress, Inc.—Folder containing descriptive literature of Hydraulic Presses of various types such as Extrusion Presses, Forging and Die Forging Presses, Rolling Mills, Push Benches and Stretching Machines. Also every kind of Auxiliary Equipment for the ferrous, non-ferrous, and Light Metal Industry. Folder also contains articles on Metal Extrusion and Modern Skill Forging.

267 SELF-LOCKING NUTS

Boots Aircraft Nut Corp.—A comprehensive review of the comparative weights of various types of self-locking nuts. Prepared for the convenience of aircraft designers, engineers, operating and maintenance personnel.

268 CENTRIFUGAL PUMPS

Lawrence Machine & Pump Corp.—Most recent addition to the series of Engineering Bulletins, Bulletin 203-3 describing Acid and Chemical Pumps. This covers a wide range of applications running from pumping of hot acids to pulps and abrasive mixtures consisting of liquids and solids. The pumps described are of various types both horizontal and vertical, lined and unlined, and of various alloys to resist the corrosive or abrasive action or both as the case may be.

269 FLEXIBLE COUPLINGS

Farrel-Birmingham Co.—New 8-page Bulletin describing Farrel Manger Couplings. These couplings are designed for applications where space limitations make a close-coupled connection necessary or desirable. By bolting the coupling flange directly to a flywheel, brake drum or similar component, complete flexibility is provided between driving and driven units in half the space occupied by an ordinary coupling. And, in addition, no dummy, pilot or stub shaft is required. The Manger Coupling is simple in construction, easy to install and align, and requires practically no maintenance. The new bulletin includes engineering details, application diagrams and tables of sizes, ratings and dimensions.

270 MATERIALS HANDLING

Yale & Towne Mfg. Co.—120-page Book containing illustrations that demonstrate recommended materials handling practice and photographs of materials handling machinery, solving handling problems in many types of industries. This book should interest many management or engineering executives in improving production and particularly in reducing the costs of handling materials.

271 BALL-BEARING SWING JOINTS

Chiksan Tool Co.—Over 500 different types, styles and sizes described and illustrated, together with dimensions, engineering data and suggested applications. Catalog No. 41.

272 SOLENOID VALVES

Davis Regulator Co.—Bulletin No. 91 describes in detail complete line of Davis Solenoid Valves for steam, air, gas, water and oil. Includes prices, specifications, application data, cross-section diagrams, etc. Shows application of Davis Dia-Ball packless transmission unit which takes the place of a packing box and provides leakproof frictionless connection between valve stem and lever on solenoid valves.

273 LARGE MECHANICAL SPRINGS

Muehlhausen Spring Corp.—New Folder illustrates and describes how large springs are hot-coiled. Described as the first of its kind, the new booklet shows in sequence the steps in manufacturing large springs, and shows facilities necessary and operations required to fabricate these springs in quantity and yet hold to the tolerances demanded by the application of the spring. The booklet represents a quick trip through the hot-coiling plant of the Muehlhausen Spring Corp., and high-lights the extensive equipment that enables this company to produce the exact type and size spring to meet any application and in the desired quantities required to fit in with production schedules.

The Latest Industrial Literature offered in this list represents recently issued Catalogs, Bulletins, Data Booklets, Charts, Information Folders and engineering information made available by current advertisers in A.S.M.E. Publications.

274 BLIND RIVETING

Cherry Rivet Co.—New Manual on Cherry Blind Rivets, No. B-44. This 36-page manual is unusually complete and profusely illustrated in color sketches, diagrams and tabular material. The manual covers the following general headings: description of the blind rivet, drilling of the hole, selecting the rivet and pulling head, operation, installation procedure, tools and inspection technique. All the phases of the Cherry Rivet process are explained in detail. The few simple rules to be followed are clearly presented in graphic form in this new manual.

275 CONTRACT WELDING

Graver Tank & Mfg. Co.—8-page Bulletin about "Graver Weldmounts" which can be used advantageously in the production of your products. The amazing efficiency and economy afforded by this modern method of steel plate fabrication has been forceably demonstrated in machine frames, rotating bed plates, Diesel engine bases—all among the various types of equipment being produced by Graver's Welding Division.

276 BALL BEARINGS

Marlin-Rockwell Corp.—Twenty-seven Bulletins on Ball Bearings—their use, installation and maintenance. Available to Engineers, Designers, Draftsmen, Shop Men, Service and Maintenance Men.

277 STEAM PLANT EQUIPMENT

Yarnall-Waring Co.—12-page Bulletin G-1306 giving general details of the Yarway line of steam plant accessories. Includes cuts and description of blow-off valves, water columns, water gages, expansion joints, steam traps, strainers, spray nozzles and the new Yarway Remote Liquid Level Indicator.

278 INDEXING AND HOLDING FIXTURES

Zagar Tool, Inc.—8-page Bulletin, profusely illustrated with application photographs, shows 1" and 2" Zagar Indexing and Holding Fixtures for milling, drilling, tapping, slotting, grinding, and especially second operations. Standard Zagar Fixtures cover many requirements without special tooling. Also included: cross sectional and mechanical data, impressive list of user concerns, etc.

279 INDUSTRIAL PUMPS

Westco Pump Div., Joshua Hendy Iron Works—Catalog No. 43, Westco Turbine Type Pumps designed for capacities to 200 G.P.M., heads to 350 ft. in single stage construction or 600 ft. in tandem (two stage) construction. One moving part, no metal to metal contact, renewable liners. Can be used to handle widely varying heads.

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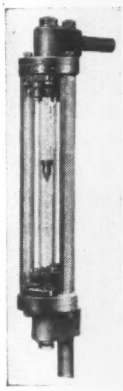
Announcements in this section are supplied by current advertisers in MECHANICAL ENGINEERING and A.S.M.E. MECHANICAL CATALOG. This section is restricted to these advertisers.

- *NEW EQUIPMENT*
- *BUSINESS CHANGES*
- *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

Improved Universal Rotameter



Among the many design advantages incorporated in the new "S & K" Universal Rotameters are improved appearance, greater flexibility of installation and easier maintenance. The one-piece frame construction, similar to that of previous SK Rotameters, has been retained and new type end-castings allow for twenty-five different piping hook-ups. Inside of tube can be cleaned without removal and tube assembly can be withdrawn if necessary without disturbing pipe connections.

The Rotameter is a simple, low-cost instrument which accurately indicates the rate of flow of a liquid or gas in a pipe line. They are widely used throughout the chemical process, power and other industries. For full details, write for the illustrated bulletin on the new SK Universal Rotameter. Schutte & Koerting Co. 12th & Thompson Sts., Philadelphia 22, Penna.

Ashcroft Duraswitch

Manning, Maxwell & Moore of Bridgeport, Connecticut, announce the new Ashcroft Duraswitch (Patent applied for). The new Duraswitch is a sturdy, dependable switch in combination with the Ashcroft Gauge. The gauge has slide rule dial easily readable for accurate adjusting of the switch to control point. This unique combination saves space on equipment, eliminates extra fittings, saves on installation, while contributing greatly improved appearance. The series E-100 are for pressure only; series E-200 are for both pressure and temperature applications, as a pressure control and pressure gauge combination, or temperature control and thermometer combination, in single or duplex types.

Complete information on this new product may be had by writing direct to the Electro Mechanical Division of the above mentioned plant.

New Zagar Collet Speed Chuck

Another Zagar tool is announced by Zager Tool, Inc. The Zagar collet speed chuck is suited ideally to turning bar stock, facing off and second operation turning.

Zagar Collet Speed Chucks can be used on

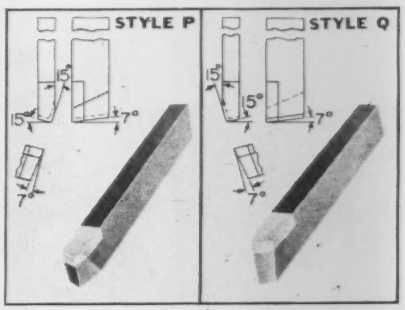
screw machines, on lathes and wherever collets are standard equipment. Practically all standard collet attachments move the collet horizontally to close the jaws around the stock. Consequently, in second operation turning, length dimensions cannot be held unless the gripping diameters of the part are very nearly identical. In Zagar fixtures the collet does not move at all. As a result, face-off and length dimensions can be held within very close limits.

Other advantages: Can be mounted on any lathe, grinder or rotating spindle; can be opened and closed while machine is running; there is no heating; being independent of spindle, can be mounted on face plate and be indicated to run dead true regardless of any spindle run-out; and affords greater than usual collet capacity.

The Zagar collet speed chuck is precision-made, being hardened and ground throughout. Like standard Zagar indexing and holding fixtures, it is available in 1″ and 2″ sizes. The 1″ size takes a standard 5-C Hardinge collet; the 2″, a master collet using standard W. & S. collet pads. Maximum capacity with special collet is $2^{1}/_{16}$″ diameter by $1^{1}/_{2}$″ deep. (Photo shows 2″ fixture.)

New Styles of Stellite-Tipped Tools

Two new styles of tipped tools especially designed for machining steel have been announced by Haynes Stellite Co., a Unit of Union Carbide and Carbon Corp., Kokomo, Indiana. The new tools, designated as Style P and Style Q, consist of a cutting tip of Stellite 98M2 cobalt-base alloy brazed or butt-welded to a tough steel shank, with proper clearance and lead angles ground for turning steel. These and other Stellite tipped tools are recommended for applica-



tions employing tools that have a large cross section or tools that are bent or offset, or for tool holders which make the use of solid tool bits impractical. In addition to use in turning, boring, and facing operations, these tipped tools are also used for various types of forming and grooving operations.

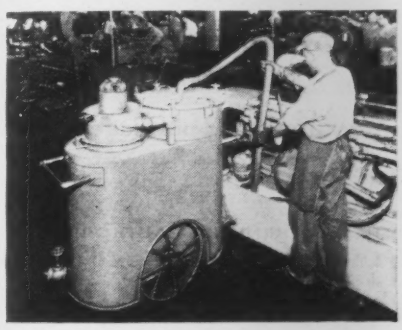
Style P is a right-hand tool; Style Q is a left-hand tool. They are ground with a 15-deg. end cutting-edge angle, a 15-deg. side cutting-edge angle, a 7-deg. end relief angle, and a 7-deg. side relief angle. These tools are furnished with flat tops, so that users can grind their own side rake angle for each particular job. Five sizes of each tool are stocked, as follows:

$^{5}/_{8} \times 1\text{-}^{1}/_{4} \times 8$ in.
$^{3}/_{4} \times 1\text{-}^{1}/_{2} \times 9$ in.
$1 \times 1 \times 7$ in.
$1 \times 1\text{-}^{1}/_{4} \times 7$ in.
$1\text{-}^{1}/_{4} \times 1\text{-}^{1}/_{4} \times 7$ in.

Styles P and Q are also made with Stellite Star J-Metal tips. Further information concerning Stellite tipped tools can be obtained from Haynes Stellite Co., Kokomo, Indiana.

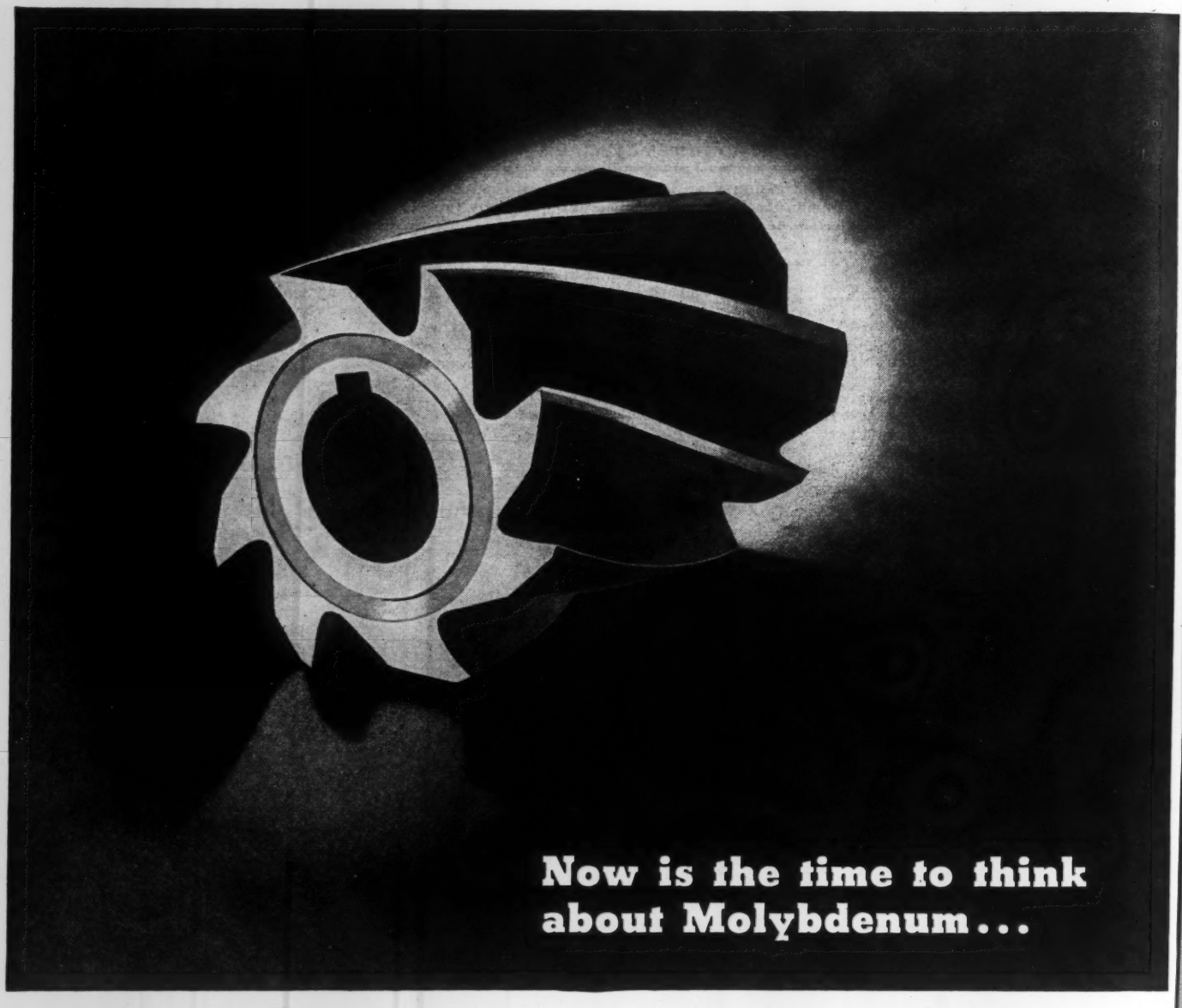
New Spencer Sump-Vac Speeds Cleaning of Sumps

A Spencer vacuum producer with a closed tank on wheels removes all liquid and sludge from sump tanks in 2 to 10 minutes compared with half an hour by former methods.



The tank capacity is 125 gallons or enough for 3 to 5 sumps, and a filter basket with rubber ball float valve collects chips and heavy sludge. The machine is emptied by gravity in two minutes. By changing two valves, it

Continued on page 31



It is generally appreciated that the item of perishable tool costs is an important factor in manufacturing accounting. The possibility of savings offered by using molybdenum high speed steels, instead of tungsten types, is therefore worth consideration.

The savings are due first to the lower cost per pound of molybdenum steels, and second to their lower density. The latter results in more tools from an equivalent poundage.

The net savings effected naturally depend on tool performance. It is an established fact that, in a substantial majority of careful comparative tests made in the past, the performance of properly heat-treated molybdenum steels equaled, where it did not better, that of tungsten steels.

A consultation with your supplier should confirm these statements, but it would be a simple matter to check them in your own plant.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue • New York City

MOLY

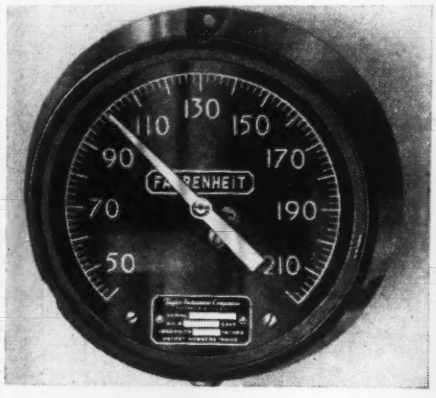
• Keep Informed

can pump the liquid to a height of six feet. No priming is necessary—and all material in the tank is removed by air vacuum after the liquid is removed.

Sizes $^3/_4$ or $1^1/_2$ horsepower, universal or single phase motors, 25 to 60 cycle, 110 or 220 volts or d.c. Vacuum hose is available in $12^1/_2$ ft. lengths with $^7/_8$ in. orifice. Cable extension is 50 ft. Bulletin on request. The Spencer Turbine Co., Hartford 6, Conn.

Taylor Announces 4½" Dial Thermometer with Plastic Case

Originally built for and extensively used by the shipbuilding industry is Taylor's new $4^1/_2$" Phenolic case dial thermometer. This mercury actuated instrument is built to withstand severe operating conditions. Available with Accuratus Tubing, it is especially well suited to installations requiring a long length of tubing between the bulb and the instrument.

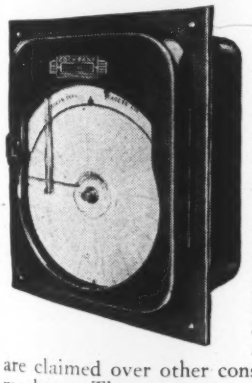


The plastic case is resistant to corrosion and shock. To make reading at a distance easy the metal dial is finished in black with white figures.

This 53K series mercury actuated dial thermometer can be had with a wide variety of standard temperature-sensitive bulb constructions and is available in the following ranges: −40° F to 120° F, 40° F to 220° F, 350° F to 550° F, 400° F to 900° F, −10° F to 110° F, 80° F to 300° F, 300° F to 750° F, 30° F to 150° F, 50° F to 400° F, 200° F to 900° F.

Write for more complete information.

Cochrane Announces New Boiler Meter



Cochrane Corp. of Philadelphia, manufacturers of flow measuring instruments, steam power plant equipment and specialties, announces a new boiler meter of the steam-flow, air-flow type, known as the Cochrane Boiler Ratio Meter. Several important advantages are claimed over other constructions on the market. The operator can establish the relation of air supply to fuel supply (measured by steam generated) most favorable to his particular operation by means of an easily adjustable cam in the air flow mechanism. Quick and easy reading is provided by a red indicating pointer operating across a white 10" scale, making it unnecessary to examine

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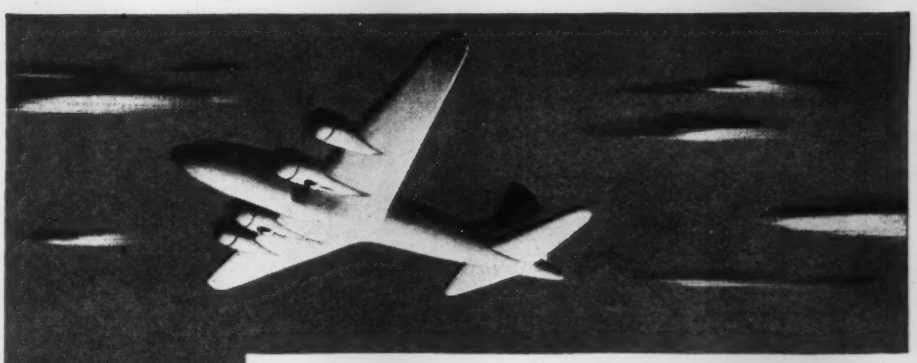
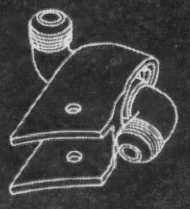
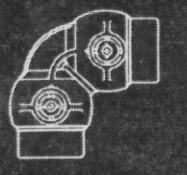
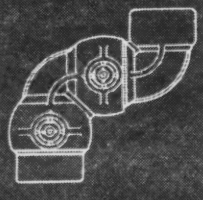
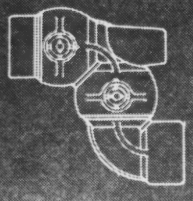


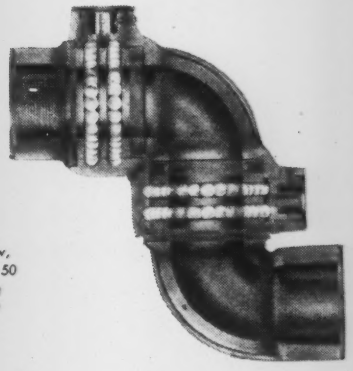
FROM SUBSTRATA TO STRATOSPHERE











Phantom View, Chiksan Style 50 Ball-Bearing Swivel Joint

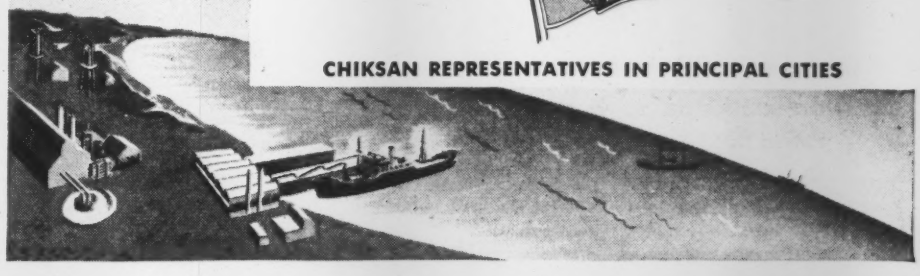
CHIKSAN **Ball-Bearing** Swivel Joints are delivering safe, dependable, economical service through extreme ranges of temperature and pressure. They provide for easy swiveling or complete rotation with minimum torque and positive sealing under pressure or vacuum.

Double rows of ball bearings assure easy turning; the self-adjusting Packing Element requires no maintenance attention. There is nothing to tighten or adjust.

With more than 500 different Types, Styles and Sizes for transferring water, oil, gas, steam, chemicals, etc., there is a Chiksan **Ball-Bearing** Swivel Joint to fit every need. Write to Dept. S for Latest Catalog and Engineering Data.

ARMY NAVY

CHIKSAN REPRESENTATIVES IN PRINCIPAL CITIES



CHIKSAN

TRADE MARK REG.

CHIKSAN TOOL COMPANY

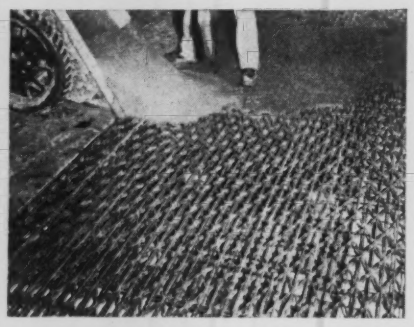
Ball Bearing SWIVEL JOINTS for ALL PURPOSES

BREA, CALIFORNIA

IRVING GRATING PRODUCTS

"A Fitting Grating for Every Purpose"

INDUSTRIAL FLOOR ARMORING



IRVING CONTINUITY ARMORING

For Heavy Duty Floors

Wherever industrial floors are subjected to severe service—in trucking aisles, loading platforms, driveways, around machines, etc.—Irving Continuity Armoring, the one-piece steel-mesh mat, will withstand abuse that destroys other types of industrial floors.

Catalog for the asking.

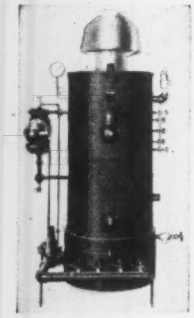
ESTABLISHED 1902

IRVING SUBWAY GRATING CO., INC.

HOME OFFICE and PLANT: 5010 27th STREET
LONG ISLAND CITY 1, NEW YORK

WESTERN DIVISION: FOOT OF PARK AVE.
EMERYVILLE 8, CALIFORNIA

An Economic Measure becomes your Patriotic Duty . . .



Getting the most for the money is always good business practice . . . in time of war especially, each individual, every corporation, all Government agencies, buying boilers or boilers, should carefully consider each purchase.

If in need of a boiler to provide a source of process steam at even pressure, with minimum attention and minimum fuel, investigate the

KANE GAS-FIRED STEAM BOILER

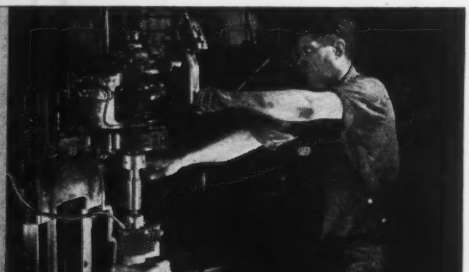
This boiler takes very little room and can generally be placed right next to the process equipment it serves. Automatic gas control throttles gas input in exact proportion to steam demands and maintains desired operating pressure. Sizes 1 to 30 H.P. Standard boilers, built to A.S.M.E. Code for 100 pounds pressure. Special boilers for higher pressures built to order.

MEARS-KANE-OFELDT INC

Manufacturers of Automatic Steam Boilers for over a third of a century.

1903-1915 EAST HAGERT STREET, PHILADELPHIA 25, PA.

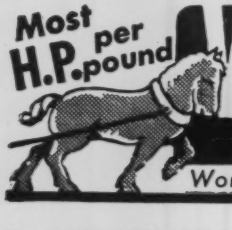
MIRROR-FINISH CYLINDER HONING



is a Production MUST for ALL WISCONSIN ENGINES

Yes . . . even the little Model AA 1 hp., single-cylinder Wisconsin Air-Cooled Engine has its 2¼"-bore cylinder honed to a high mirror finish . . . to assure smooth, full-power operation and maximum fuel and maintenance economy.

No "hidden detail" of design and construction is neglected or sacrificed to "price expediency" in the manufacture of these fine engines. These details are important to YOU in the operation of *your equipment*. Wisconsin air-cooled engine power is the answer.



WISCONSIN MOTOR Corporation

MILWAUKEE 14, WISCONSIN, U. S. A.

World's Largest Builders of Heavy-Duty Air-Cooled Engines

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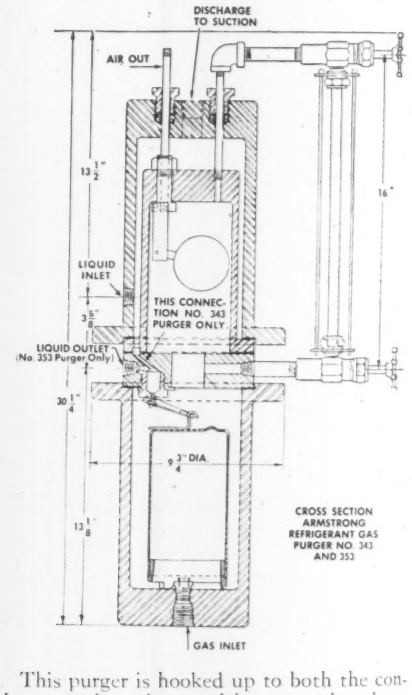
closely the position of the pens to determine whether the air is excessive or insufficient, as the movement of the pointer is 3 times as great as the differences between the pens. The steam flow mechanism is that of the standard Cochrane Friction-Free Electric Flow Meter, operating on the null balance principle, assuring highest accuracy. The air flow mechanism is based on the highly responsive Hays slack diaphragm, equipped with an electric motor follow-up for ample power. A new bulletin, No. 4071 "Double-Barreled Combustion Guidance," describing the meter, is available.

New Forged Steel Refrigerant Purger Announced

A forged steel purger for removing air and other non-condensible gases from refrigerating systems has been developed by the Armstrong Machine Works, Three Rivers, Mich., who also manufacture cast semisteel purgers. The forged steel purger is designed for high-pressure CO_2, ammonia and freon systems and for service where engineers prefer the quality of all steel construction.



This purger is hooked up to both the condenser and receiver and is reported to keep the system free of non-condensibles with no appreciable loss of refrigerant gas. The unit is fully described in a new bulletin, No. 160, which discusses non-condensible gases, causes of high condenser pressures, methods of purging, etc., and gives complete data on Armstrong purgers, with specifications and prices.

Cochrane Adds Rotameters to Instrument Line

Cochrane Corp. of Philadelphia announces the acquisition of exclusive sales rights to the line of Rotameters manufactured and hitherto sold by Rotameters, Inc., of Jenkintown, Pa. According to P. S. Lyon, President of the Cochrane Corp., this is a logical addition to the Cochrane meter line, as Cochrane has manufactured and sold a recording area type meter for the past seven years and the addition of the rotameter, or indicating type of area meter, rounds out the line.

No change will be made in the personnel of the two companies, William C. Bennett being manager of Cochrane's appliance

• Keep Informed

division, with W. W. Tomes in charge of sales and William Melas in charge of engineering, while for Rotameters, Inc., J. B. Vandegrift, recently appointed general manager, is associated with Alfred Elsasser, technical director, Robert C. Wolf, chief engineer, Reynold Wilson and Joseph Madden, glass technologists, and Howard Forepaugh, office manager, several of whom helped pioneer the development of the American rotameter into a successful measuring device with interchangeable precision-bore tubes. The Rotameter will be sold by Cochrane flow meter representatives.

Modern Boiler-Maker Puts Best Foot Forward

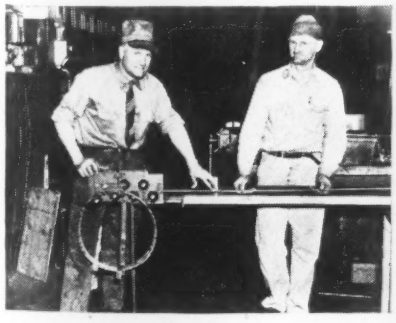
Welder number 194 illustrates up-to-date method of boiler-making by fusing a nozzle on a new high-pressure boiler for TVA hydroelectric system. This is one phase of arc

welded power plant construction as produced at Chattanooga shops of Combustion Engineering Co. (Official OWI Photo-Courtesy Lincoln Electric Co.)

Shop-Devised Tubing Straightener Speeds Diesel Production at Cooper-Bessemer

A device which solves a time-consuming operation—that of straightening rolled steel tubing—has been devised by two employees at the Grove City, Pa., plant of The Cooper-Bessemer Corp., Mount Vernon, Ohio.

Typical of many practical ideas that have been conceived and put into use to increase efficiency in engine-building at this 111-year-old company, the tube straightener is one of the simplest of any of the labor-saving tools used in the shop. Made of a few odds and



ends of metal and a series of five rollers, the device eliminates former hand straightening operations which consumed many valuable man hours that could be utilized in more productive work.

The tubing, of $^1/_4$ and $^5/_{16}$-inch diameter, is received in large coils and previously had to be unwound as needed, straightened with a paddle, then bent and formed to fit a specific connection.

With the new device shown in the accompanying illustration the coil is simply posi-

Continued on page 34

Cutting Slurry Handling Costs in Coal Washing

The operations of a midwestern coal company involve handling 600 to 1,000 gallons per minute of coal washery slurry which has a high pyrites and sulphur content. An analysis shows 100% minus 3 mesh, 85% minus 6 mesh and a specific gravity of approximately 1.5. About 45 tons of solids per hour are handled. The conditions involve a 36′ lift and discharging through 700′ of 6″ wood stave pipe.

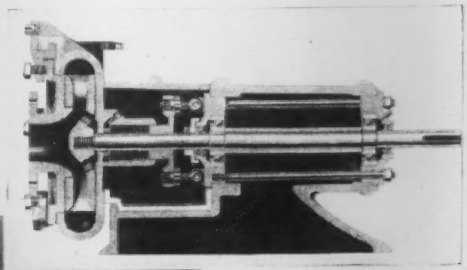
In August, 1942 the company wrote us:

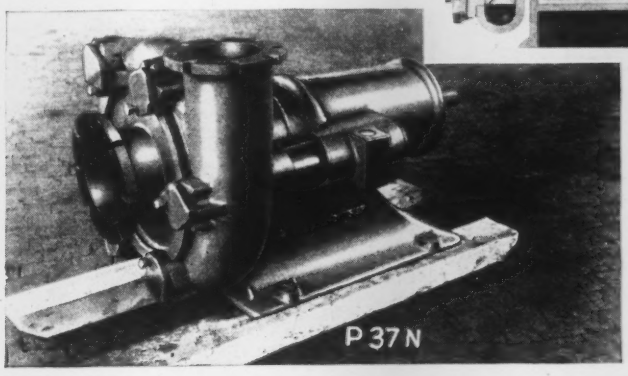
"We have been using for the past six or seven years a 4″ rubber lined pump. The lining was entirely unsatisfactory due to the short life of the rubber and continual replacement. We then changed this pump over to a nickel steel alloy shell, and eliminated the rubber lining by the use of steel wearing plates. However, we were still wearing out a case about every six months and an impeller about every three months, which amounts to a high maintenance cost."

Subsequently an Amsco-Nagle 6″ Type "T," frame 19, manganese steel fitted pump like the unit pictured below was installed in this plant. We are now informed:

"The Amsco-Nagle pump was put into operation in January, 1943 and has operated 2½ shifts (20 hours per day) without trouble. The only replacements (after 11 months) have been a new suction plate and a new impeller. The previous pump operated only about half as many hours daily. The present pump has never been repacked. It was necessary to pack the former pump every few days."

Where abrasive or corrosive liquids are handled, Amsco-Nagle pumps are the economical solution. Ask for Bulletin 940.





Above: sectional view of Amsco-Nagle Type "T" Pump. At left: Type "T" Pump of the design used to handle coal washery slurry.

Send for Bulletin 941-W on Amsco Conservation Welding Rods.

Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois

AMERICAN Brake Shoe COMPANY

FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

The "FRAHM" VIBRATING-REED HAND TACHOMETER . . .

requires no contact with the rotating element and is unique for measuring speed of totally enclosed machines and other equipment where the end of the shaft is not accessible. The only mechanism is a set of accurately tuned steel reeds which vibrate by resonance according to the speed of the machine with which the instrument is held in contact.

For hand use in servicing, installation and maintenance work; also built in types for permanent mounting. Various ranges available from 900 to 30,000 r.p.m.

Write for descriptive Bulletin 1590-M.

The JONES HEAVY DUTY HAND TACHOMETER

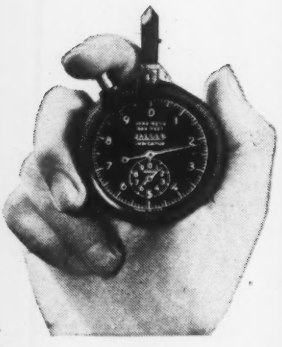
is used for indicating r.p.m. and surface speeds of all types of machinery in which the moving parts are readily accessible. Simple, rugged and reliable, it is built to maintain accuracy in hard, everyday service. Single and triple range models up to 12,000 r.p.m. supplied complete with carrying case and accessories.

Write for descriptive Bulletin 1710-M.

. . . The JAEGER SPEED INDICATOR

is a "vest-pocket" speed-measuring device which adds up the number of revolutions over a period of six seconds and shows the revolutions per minute without any calculations. Can also be used to measure speeds in feet per minute. Available in two models—for all speeds up to 2000 r.p.m. and for all speeds up to 10,000 r.p.m. Supplied complete with carrying case and accessories.

Write for descriptive Bulletin 1750-M.



JAMES G. BIDDLE CO. **1211-13 ARCH STREET PHILADELPHIA 7, PA.**

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tioned over a bracket at the side of the contrivance, the loose end is threaded through the rollers and the tubing is straightened by pulling it out along a horizontal tray where it is measured and cut off to the required length.

With nearly a mile of such tubing used monthly in the assembling of Cooper-Bessemer diesel engines for various branches of the armed services, the tremendous saving in time and effort through the adoption of this novel machine is apparent.

Second Renewal Star for D. O. James

Shown above is Lt. Col. L. M. Eek, Air Liaison Officer of the Sixth Service Command, presenting Air Medal at D. O. James Mfg. Co. of Chicago Employees' Party commemorating the Second Renewal Star of the D. O. James Army-Navy "E" Award Flag.

Mr. Ignatz Halunka, a D. O. James gear veteran of 22 years, is receiving the Air Medal for his son, Staff Sergeant Walter Halunka, now a German prisoner of War. The Air Medal was given Sergt. Halunka for exceptional meritorious services.

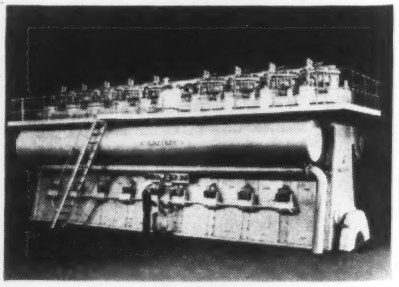
Also shown in picture are Mrs. Halunka and daughter and Captain C. R. Riche of Sixth Service Command.

Over 1200 D. O. James employees participated in the ceremonies and partook of the buffet supper and dancing that followed.

"Fin" Heating Section Patent

A patent on the cast iron "fin" heating section used in their unit heaters, blast coils, and radiation equipment, has been issued and assigned to D. J. Murray Mfg. Co., Wausau, Wisconsin, according to an announcement from the United States Patent Office. This "fin" heating section is made in one piece of high-test cast iron, so that there are no soldered, brazed, welded or expanded connections in it. The unit heaters and blast coils using this new "fin" section carry the trade name "Grid".

Successful Completion of Tests of a Large Diesel Engine



Nordberg Manufacturing Co., builders of the first large Diesel engines in this country in 1915, announces the successful completion of tests of a large Diesel engine which is available in sizes from 4000 to 8000 S.H.P. in 6 to 12 cylinders for single or twin engine direct drive; and also twin engine,

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geared single screw ship propulsion, as well as for stationary applications from 3000 K.W. to 6000 K.W. It is the most powerful single-acting Diesel engine ever built in America. The engine herein described is intended for direct drive marine service and is to be installed in a "Victory" ship of the United States Maritime Commission program.

GENERAL DATA

Shaft Horsepower (normal)	6000
Overload Capacity	10% continuous 25% for two hours
Brake Mean Effective Pressure at 6000 S.H.P. Rating	62 psi.
Speed	160 R.P.M.
No. of Cylinders	9
Cylinder Bore and Stroke	29" x 40"
Type of Engine	2 cycle, single acting, crosshead
Type of Fuel Injection System	Mechanical
Type of Scavenging Blower	Centrifugal, motor driven

In general, the design follows the lines of other Nordberg 2-cycle Diesels of recent years, the exceptions being in the camshaft drive and reversing mechanism, and overhead location of camshaft which was necessary because of the much greater physical dimensions of this engine.

Simplicity of design, rugged construction, streamlined appearance, and accessibility of all working parts are salient features of the engine and the result of thirty years' experience in building large Diesel engines and other heavy-duty machinery. Every effort has been made by Nordberg to simplify designs and reduce the number of parts, and accomplishments in this respect are revealed by the sectional views and the attached photographs. Rugged construction is revealed in the design of the separate parts and major assemblies such as bedplate, "A" frames or columns, and cylinder blocks. Scavenging air and exhaust headers are located on opposite sides of the engine.

TESTS AND RESULTS

This engine was completely erected in the Company's shop and given the following tests:

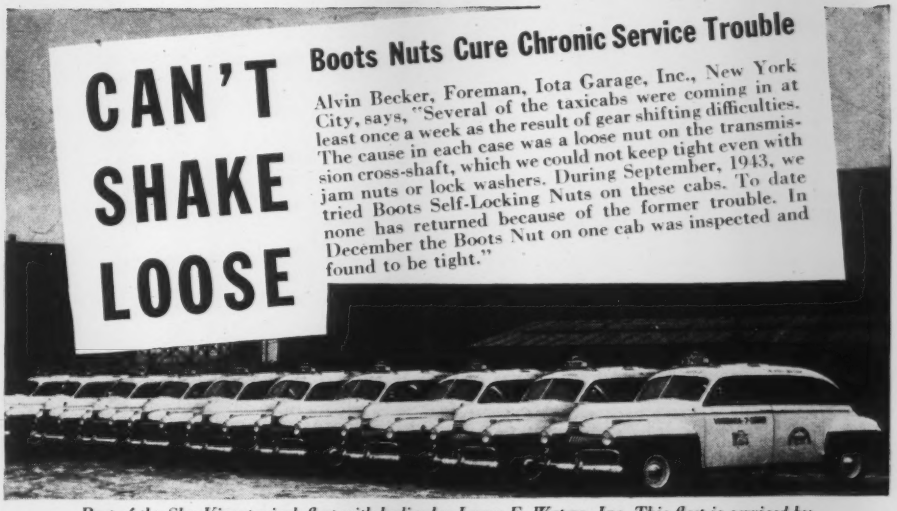
(a) 360 hours continuous endurance run with the engine developing normal S.H.P. of 6000 at 160 R.P.M.
(b) 48 hours continuous run at 110% load or 6450 S.H.P. at 165 R.P.M.
(c) 2 hours at 125% load (7300 S.H.P. at 172 R.P.M.).

Other tests were run to determine starting, governing and maneuvering characteristics, and fuel consumption at various loads with corresponding propeller R.P.M. All tests were conducted with the engine burning heavy fuel oil and the fuel consumption results are shown on the attached curve. The fuel consumption as shown does not include the power to drive the scavenging air blower. This power will be obtained from the auxiliary generating sets aboard the vessel. The input to the blower at normal load is 430 B.H.P.

Higher powered Diesel engines for propelling cargo ships, tankers, combination cargo-passenger and other vessels must be capable of operating on low grade fuel oils. Nordberg pioneered in this development and has many Diesel engines successfully operating on the heavier and cheaper grades of fuel oil.

The engine herein described is of the mechanical injection type with water-cooled fuel nozzles. The fuel consumed during the

Continued on page 37



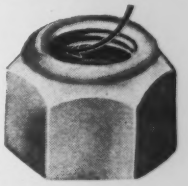
Part of the Sky-View taxicab fleet with bodies by James F. Waters, Inc. This fleet is serviced by IOTA GARAGE, INC., New York City. Boots Nuts were tested on cabs like these.

IN THIS modern repair shop, the Boots All-Metal Self-Locking Nut has demonstrated again how effectively it can eliminate the trouble, delay and expense so frequently caused by a loose nut. The Boots Nut *locks* itself tight—and it *stays* tight until you take it off for use again. It *can't* shake loose. Consequently, when peace makes the Boots Nut available, fleet operators will profit by new economies in maintenance, fewer interruptions in service and longer life in equipment. "There's no excuse for a nut shaking loose!"

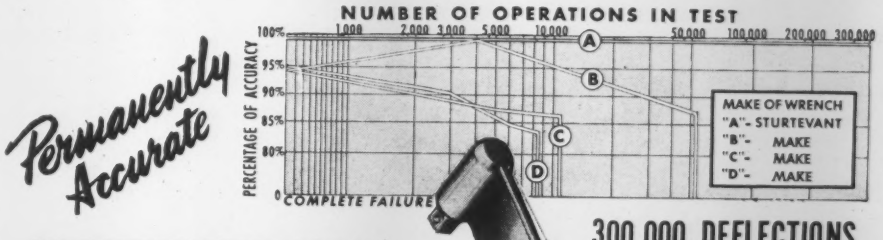
BOOTS SELF-LOCKING NUTS
"There's No Excuse for a Nut Shaking Loose"

Boots Aircraft Nut Corp. • General Offices, New Canaan, Conn.

The ALL-METAL lock is built in here



ROL-TOP. This style nut now made for exclusive use on all types of aircraft engines. It is the nut referred to in the above text.

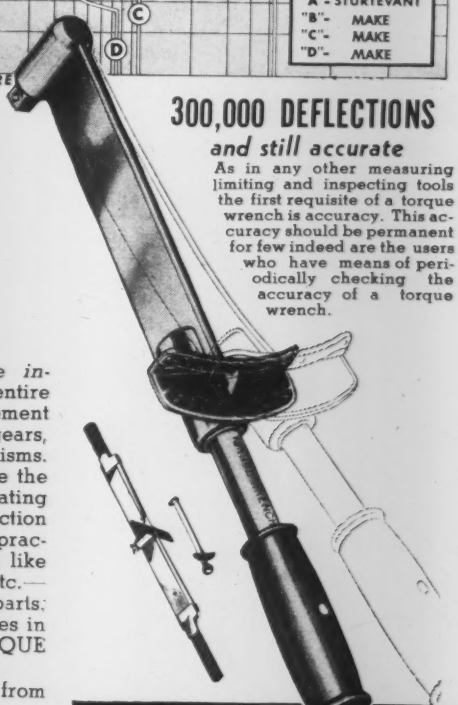


Permanently Accurate

STURTEVANT QUALITY

300,000 DEFLECTIONS
and still accurate

As in any other measuring limiting and inspecting tools the first requisite of a torque wrench is accuracy. This accuracy should be permanent for few indeed are the users who have means of periodically checking the accuracy of a torque wrench.



Permanently Accurate
Torque Wrenches

STURTEVANT TORQUE WRENCHES are *inherently accurate* because they use the entire beam of the wrench as the measuring element and readings are direct—not through gears, levers or other error-compounding mechanisms. They will give you years of service because the beam is ground to uniformly spread operating stress along its entire length, and all deflection is well within its elastic limits. They are practically indestructible, and can be handled like any other tool, on the bench, in the tool box, etc.—have no fragile dials, delicate springs or parts. That is why the majority of Torque Wrenches in use today are STURTEVANT TORQUE WRENCHES.

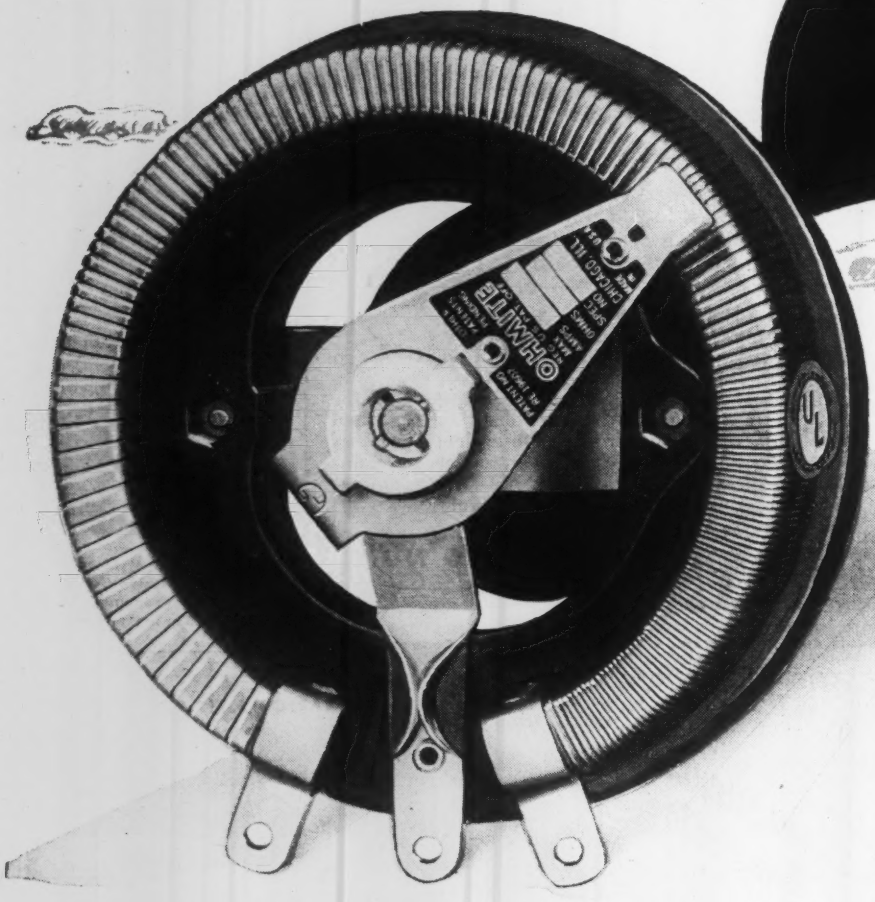
Over 100 models and types with capacities from 0–40 inch ounces to 7200 inch pounds.

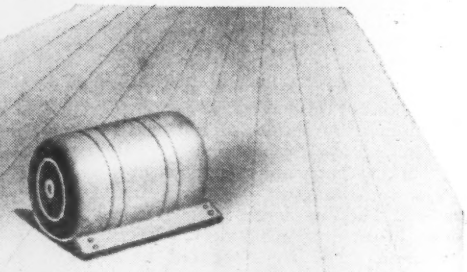
Write for Bulletin TW-17

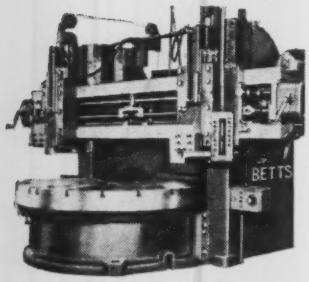
PA STURTEVANT CO.
ADDISON QUALITY ILLINOIS

OHMITE
RHEOSTATS

Smooth, Close, Continuously Variable Motor Speed Control







Used in Boring Mill Speed Control

A typical example is the use of two Ohmite taper-wound Model "R" Rheostats in the control system of this Boring Mill to help facilitate and speed up the machining of tank turrets.

Ohmite Rheostats are the *"heart"* of many of today's popular speed control systems for fractional horsepower and large power motors. Often, two rheostats in tandem are used to achieve both field and armature control.

This popular use of Ohmite Rheostats is logical—because: (1) they provide smooth, close, continuously variable control of a wide range of speeds; (2) they are compact—simple and convenient to use; (3) they have long life; there is nothing to shrink, shift or deteriorate.

Ohmite Rheostats are made in ten wattage sizes—from 25 to 1000 watts, from 1 1/16" to 12" diameter—in straight or tapered winding—in single or tandem assemblies—in regular or special types.

OHMITE MANUFACTURING COMPANY
4807 FLOURNOY STREET, CHICAGO 44, ILLINOIS

Send for Catalog and Engineering Manual No. 40. *Write on company letterhead for this complete, helpful 96-page guide in the selection and application of Rheostats, Resistors, Tap Switches, Chokes and Attenuators.*

Be Right with OHMITE
RHEOSTATS • RESISTORS • TAP SWITCHES

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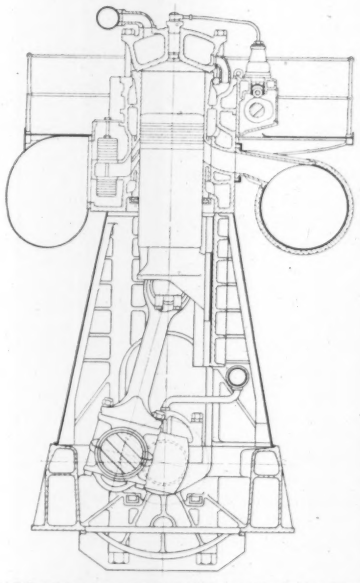
continuous seventeen-day test at 100%, 110% and 125% loads varied from 1000 to 1200 S.S.U. at 100° F., 11.5 to 12.5 Baume at 60° F., and contained from 11.4 to 17% hard asphalt and 9 to 10% Conradson residue.



CROSS SECTION OF 29" BORE. CROSSHEAD TYPE NORDBERG DIESEL ENGINE

Prior to the beginning of official tests, heavier fuel oils of 1400 to 1600 S.S.U. at 100° F. were consumed over long periods of time with clear exhaust and with no difficulty. No changes were made in the fuel injection equipment and there was no noticeable change in fuel consumption.

Many samples of the fuel oils used during the official test showed the following average analysis after being centrifuged:

SSU at 100° F.	1076
Baume at 60° F.	11.5
Flash Point, ° F.	261
Fire Pont, ° F.	324
Sulphur	.82
Water and Sediment, %	.59
Asphalt, Hard, %	13.2
Conradson Residue, %	9.57
BTU's/Lb., H.H.V.	18,345

It is conceded that the lower grades of fuel oil can best be burned in slow-speed, two-cycle, heavy-duty Diesel engines. Proper timing of fuel admission is necessary and, on the Nordberg engines, the timing may easily be varied within the limits required for a wide range of fuels. The attached photographs of the fuel nozzles and pistons taken immediately after completion of the seventeen-day test and during the official post test examination of the engine show unusual cleanliness of the injection nozzles and pistons. Cylinder liner and piston ring wear was imperceptible and all rings were free.

The results of exhaustive tests of this engine indicate that it will successfully operate on heavy, low-grade fuel oil.

This engine is applicable to either marine or stationary services. The standard engine speed of 160 R.P.M. for marine service is low enough for direct drive with suitable propeller efficiency in single or twin screw ships, but the engine may also drive through a reduction gear set with optimum propeller efficiency. The engine may be operated through its entire speed range without encountering harmful peaks of torsional vibration. The engine speed for stationary service is 164 R.P.M. at which the standard rating per cylinder is 500 K.W., thus a nine-

Continued on page 38

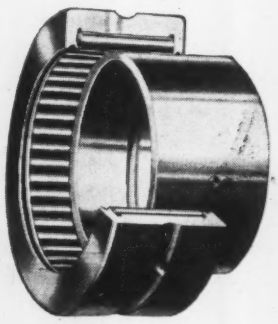
In the
POST WAR WORLD

When the energies of men once more turn to constructive pursuits, McGILL will be in a position again to supply the demand for fine bearings. With a world to rebuild, with a long denied consumer market to satisfy, with the new fields scientific development will open, that demand is bound to be heavy.

When that day comes, McGILL's Engineering Staff will be ready to help solve any special or specific bearing problem you may have. "Solidend" *MULTIROL* Full Length Roller Bearings come in standard sizes to fit all average purposes. They can be specially made for any unusual application. When planning for your post war requirements, remember that McGILL stands ready to serve you.

McGill Bearings are used in landing barge winches

Greater Load Capacity.
No Loose Retaining Rings.
Provision for Incidental Thrust.
Precision Tolerances.
Effective Sealing.
Great Rigidity - eliminates vibration and noise.



McGILL MANUFACTURING CO., INC.
BEARING DIVISION — 1100 N. Lafayette St.
VALPARAISO - - - INDIANA

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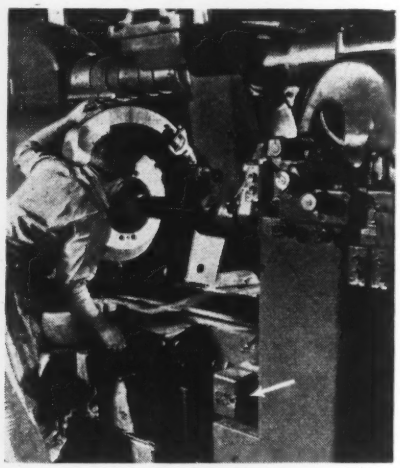
cylinder engine as shown develops 4500 K.W. which would require only six units for a moderate size central generating station of 27,000 K.W. capacity.

Electronic Time-Delay Relay Controls Grinding Time in Motor Stator Production

Helping to make this grinder more automatic at General Electric's Lynn (Mass.) River Works is a small G-E electronic time-delay relay (lower right) which times the period for grinding concentric bores in the stators of Tri-Clad motors. One of many installed on grinding machines in this plant,



this timer is preset so that after a certain period, depending on the amount to be ground and the size of the grinding wheel, it automatically stops the grinding operation.

The heart of this electronic time-delay relay is a small electron tube of the type used in home radio sets. The timer has no continuously moving parts, so it is especially useful for often-repeated, short-time cycles.

"Di-Acro" Shear No. 3

O'Neil-Irwin Manufacturing Co., Minneapolis, Minn. announce their latest product, the "Di-Acro" Shear No. 3.

The "Di-Acro" Shear No. 3 is a rugged precision built unit that incorporates all the changes and refinements that have been developed from actual operating experience and research in the field of precision shearing.

These new shears also incorporate many changes and improvements that were obtained from nine different production models of various size "Di-Acro" Shears that were produced and delivered in mass quantities since 1940.

The construction of the "Di-Arco" Shear No. 3 includes such qualities as a precision adjustment for accurately stopping blade travel, which permits the shear to be readily arranged for a large variety of slitting and notching, to extremely close tolerances that cannot be obtained with ordinary metal working shears.

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A metal stripping guide, moving with the shear blade, is mounted upon the unit, that allows the "Di-Acro" Shear No. 3 to be employed for stripping all types of materials, within the capacity of the Shear, to extremely narrow widths.

A delivery chute, built within the unit, will positively deliver all materials, fabrics, and tissues at any speed within the ability of the operator to feed the shear. This feature allows material that has been sheared to be automatically loaded into a recepticle without attention from the operator.

The new "Di-Acro" Shears is of exceptionally heavy and rugged construction, the main bed casting of machine tool grey iron weighs 80 lbs. and provides an exceptional sturdy base for the foundation of the complete shear.

The finished unit weighs in excess of 150 lbs. with all moving parts properly weighed and balanced to distribute shearing load which provides a unit that can be very easily operated.

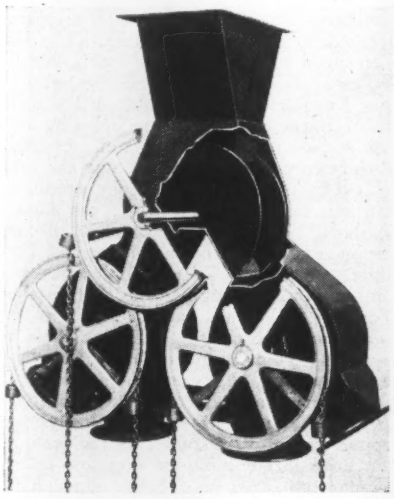
All bearings are fully adjustable for wear and alignment, and rifle drilled for complete lubrication to all points of friction.

Both shear blades are fully adjustable for tolerances in shearing as well as for the control of the angularity of pitch which can be quickly varied as desired for the shearing of all types of materials, ranging from heavy steel sheet and spring tempered materials, within the capacity range of the unit, to the very lightest of fabrics and tissues, all of which can be sheared without buckling or knurling.

A 40-page catalog is available upon request covering the "Di-Acro" Shear No. 3, and the various other products of our manufacture that are employed in the new engineering technique concerning the "'Di-Acro' System of Die-Less Duplicating."

Non-Leaking Multiple Outlet Flop Gate Ideal for Dusty and Powdery Materials

The C. O. Bartlett & Snow Co., Cleveland 5, Ohio, manufacturers of conveying, elevating and processing machinery, has just introduced a modification of the well-known inverted "Y" Multiple Outlet Flop Gate, that is said to prevent any leakage down the wrong leg, even when handling dusty or powdery materials.



This new gate—see sectional view above—directs the material down one leg of the gate, or the other, with a pivoting chute having semi-circular sides, instead of the pivoting

Continued on page 40

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nothing up his sleeve

• No "magic wands" or "cure-alls" are at the command of the Stuart service engineer. For a wand he uses the fund of engineering experience developed by D. A. Stuart Oil Co. over 79 years in the business. Instead of cure-alls, he offers top quality cutting fluids engineered to job requirements. With these simple tools he has achieved results in metal-working far more useful than the best that magic can boast. With your cooperation, we feel confident that he can do the same for you.

Our free booklet called "The 577th Oil" gets down to cases. Write for your copy.

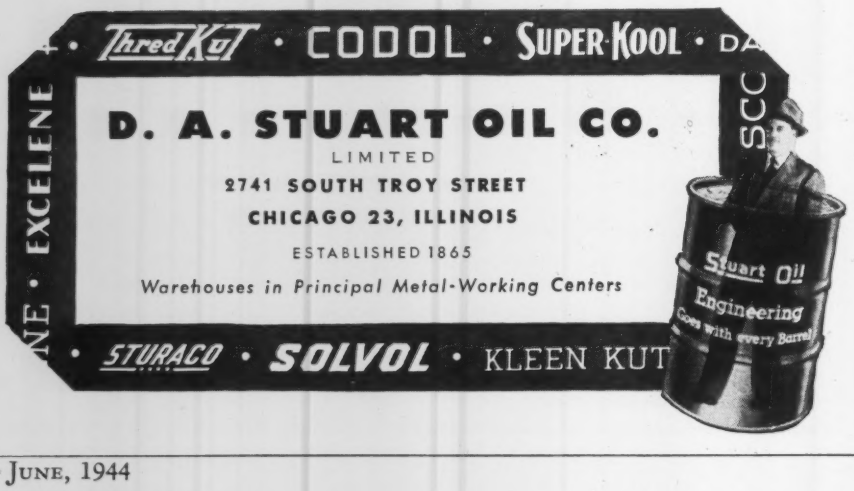

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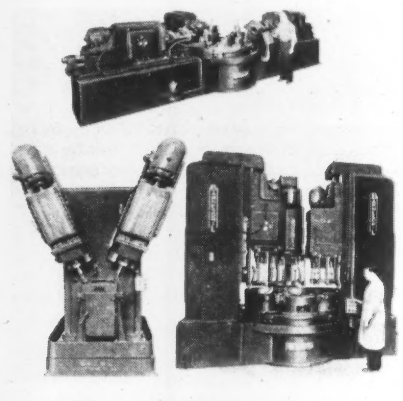
plate used in conventional construction. Material passing through the gate—regardless of how fine or powdery—is wholly contained within the chute,—and has no opportunity to pass down, and out the wrong leg, through the clearances that must of necessity be maintained in pivoting plate construction. The chutes are operated easily with a chain and chain wheel,—without any sticking or binding—and are held in position by gravity until changed. The gates have self-damming spouts and are available with 2, 3, 4, or more outlets,—and in any capacity desired. Additional information, dimensions, etc., are available from the Company on request.

Hydraulic Production Drilling Unit

The Barnes Drill Co., 814 Chestnut St., Dept. 83, Rockford, Illinois, has announced the completion of a new Special Hydraulic Production Drilling Unit. This Unit can be arranged for drilling, reaming, facing, boring, counterboring or tapping operations in any one or combination of horizontal, vertical or angular positions. The Unit is available in three sizes (Nos, 5, 10 and 20) and each size is motorized according to the requirements of the job. The number 5 Unit is equipped with a 5 to $7\frac{1}{2}$ hp. motor, the number 10 Unit with a 10 to 15 hp. motor, and the number 20 Unit with a 20



to 25 hp. motor. The number 10 and 20 Units have the essential working parts built-in complete with a single motor driving the spindle rotations and hydraulic pump for any automatic hydraulic feed cycle. The number 5 Unit is equipped with a separate motor driven hydraulic system. The Unit is arranged to give rapid approach, variable feed and quick return. Maximum, uninterrupted production can be obtained with the use of Barnesdril automatic indexing table with a spare loading station and a hydraulic decelerated control for positioning the table.

Used vertically as a hydraulic production machine, as shown in Fig. 1, the Unit is capable of performing simultaneous drilling, reaming and counterboring operations. These Units can also be arranged vertically in combination with angular and horizontal applications. Vertical arrangement of the Units around a rotating indexing table will result in savings in machining and handling time by combining several operations.

The Units can be arranged for horizontal operations, either as single Units, grouped around an indexing table, as illustrated in Fig. 2, or in combination with vertical and angular applications. Each Unit has a flange support for mounting interchangeable auxiliary heads of any desired number and arrangement of spindles. One standard Unit, equipped with an 8-spindle auxiliary head and used horizontally as a self-oiling production machine, is capable of facing and

• Keep Informed

counterboring as many as 8 bosses simultaneously.

Numerous angular applications of these Units are possible. Shown in Fig. 3 is the Two-spindle No. 10 Unit Angular Dilling Machine, equipped with two automatic operating hydraulic drilling Units with all essential working parts built-in. These two standard Units, used in an angular position, may be used for drilling and counterboring 12 holes in a propeller shaft, two at a time.

The low cost, high production possibilities of these machines are almost unlimited. They can be furnished suitably mounted on the proper columns, horizontal beds, supports, hydraulic indexing tables and other elements as a machine complete in itself.

The hydraulic system of the built-in motor, on the No. 10 and 20 Units is automatically cooled by a fan blower mounted on the shaft in front of the motor. More efficient machining of the work and longer life of the cutting tool is effected by a motor driven chip conveyor, which automatically removes chips from the indexing table and deposits them in a receptacle at the rear of the machine. All controls are located on one side of the Unit, convenient for the operator.

These Barnesdril Standard Units have considerable versatility because they can be quickly and economically converted to future requirements.

Complete details and specifications of these Units are available in a new 8-page bulletin #150, available upon request to above named firm.

• BUSINESS CHANGES

Haggerson President U. C. C.

At a meeting of the Board of Directors April 25, Fred H. Haggerson, Vice President and Director, was elected President of Union Carbide and Carbon Corp., succeeding Benjamin O'Shea who has been President since 1941 and now becomes Chairman of the Board. Mr. Haggerson has been associated with Union Carbide and Carbon Corp. for 25 years.

Hanlon-Waters Acquired by McAlear Interests Now Affiliated with Climax Engineering Co.

Hanlon-Waters, leading manufacturer of control instruments for the oil and synthetic rubber fields, has been acquired by interests owning McAlear Manufacturing Co. and Climax Engineering Co., and in the future will be operated as a division of the latter group, under continuing Hanlon-Waters management.

McAlear Manufacturing Co., Chicago, is the maker of similar control devices used principally for industrial and heating service.

The two companies will be operated as separate divisions using the full plant facilities of each, it was stated by Edward F. Deacon, Climax president. However, there will be close collaboration between the engineering and sales staffs and each line will be immediately supplemented by exclusive developments, patents and features of the other.

McAlear will take over selling and distribution functions of both companies in the industrial, power, processing, marine and heating fields. Hanlon-Waters will continue to concentrate in the oil field, where it has been a dominant factor for some years.

The Hanlon-Waters line includes, in addition to automatic control instruments, bolted and welded steel tanks and separators.

Continued on page 42

FRASER-BRACE ENGINEERING CO., Inc.

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A study of all dust factors, existing and potential—the type of dust to be handled—mechanical problems of location of the system—are just a few of the preliminary considerations which require the engineering "KNOW-HOW" which AAF is ready to put at your disposal NOW before the post-peace rush for new equipment begins.

Requests for information on the use of AAF equipment indicate the importance of planning post-peace dust control TODAY. May we help you too? Send for a copy of "AAF In Industry"—which describes the full line of AAF equipment and its applications.

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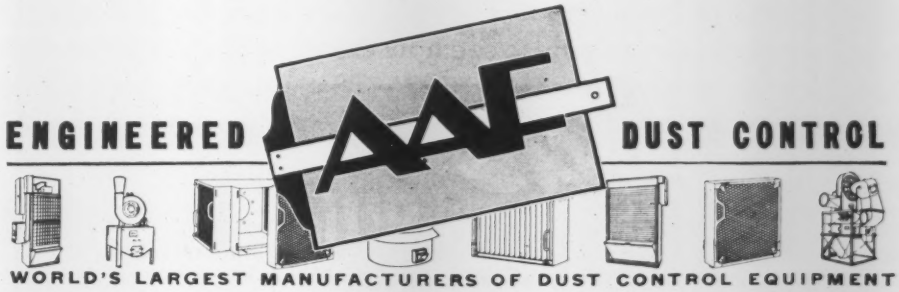

ENGINEERED DUST CONTROL

WORLD'S LARGEST MANUFACTURERS OF DUST CONTROL EQUIPMENT

The company holds large Government contracts for portable military pipe lines, which the company's engineers helped to develop.

Climax Engineering Co., Clinton, Iowa, third member of the group, manufactures gas, butane and Diesel engines, electric generating sets, etc., widely used in the oil and power fields.

Minneapolis-Honeywell, Brown Division, Makes Changes in Sales Staff

Al J. McCullough and Jack E. MacConville have been placed in joint charge of industrial instrument sales for the Brown Instrument division of the Minneapolis-Honeywell Regulator Co. at its Cleveland, Ohio, office.

Mr. McCullough has been with the Cleveland branch for the past eight years. Mr. MacConville has been with the Brown division for the past 15 years, most of that period having been spent in the sales department, at the Philadelphia home plant of the Brown organization. Both appointments became effective April 1st.

Wallace Johnson Appointed Hendy General Sales Manager

Wallace Johnson was recently appointed general sales manager of the Joshua Hendy Iron Works at Sunnyvale, Calif., according to an announcement from Charles E. Moore, president of Hendy, with whom Johnson has been associated for a number of years.

With an engineering as well as a sales background, Mr. Johnson comes to his new post well qualified to direct the sales of this largest western manufacturer of prime movers. He is a graduate of California Institute of Technology in mechanical engineering.

His first association with Mr. Moore was as sales engineer for the Moore Machinery Co. Later he moved to another Moore interest, the Autometric Machine Tool Co., where he served as sales manager and chief engineer. During his work with Autometric, he established sales outlets and dealers throughout the United States and in foreign markets for this firm. Following the sale of Autometric Machine Tool Co. to the Kearney and Trecker Corp., of Milwaukee, Wisconsin, Mr. Johnson assumed the general management of Production Engineering Co. of Berkeley, Calif.

In November 1942, Mr. Johnson joined the Hendy organization. His work has included several months at the Crocker-Wheeler Division at Ampere, New Jersey, in the capacity of assistant to Mr. Moore; several months as an administrative head at Sunnyvale; and since June 1943 until his current appointment, he has been assistant general manager of the Pomona Pump Div. at Pomona, Calif.

Morris Levit is head of sales for the Joshua Hendy division, with C. L. Barrett as sales manager at Pomona division and L. T. Warner at Crocker-Wheeler div.

Goldstrohm, Muschamp Elected Board Members of Brown Instrument Co.

Paul L. Goldstrohm and George M. Muschamp have been elected members of the board of directors of the Brown Instrument Co., Philadelphia manufacturer of precision industrial instruments. Mr. Muschamp is vice president in charge of engineering of the Brown company, a division of Minneapolis-Honeywell Regulator Co., and Mr. Goldstrohm is vice president in charge of production.

Bearings Company of America Elects New Officers

At the annual meeting of the Board of Directors of the Bearings Co. of America, Lancaster, Pa., recently held, the following officers were elected for the ensuing year: Jack L. Straub, chairman of the board; Henry W. Jackson, president, Charles D. Addams and John I. Hartman, vice presidents; E. E. Marshall, secretary-treasurer; Oliver J. Swartz, assistant secretary-treasurer.

Wickwire Spencer Steel Co. Elects Dunlap and Early Vice Presidents

At the meeting of the Board of Directors following the Corporation's Annual Meeting, Mr. R. T. Dunlap and Mr. E. F. Early were elected Vice Presidents of the Wickwire Spencer Steel Co., it was announced.

Mr. R. T. Dunlap was previously Assistant to the President and for the past several months has been acting in the capacity of General Superintendent at the Company's Buffalo Plant.

Mr. Dunlap is well known in the steel industry as an authority on plant installations, production and operation. Prior to joining Wickwire Spencer, he was General Works Manager of the Vulcan Iron Works at Wilkes-Barre, Pennsylvania. It is stated that under his direction the operating efficiency of the Buffalo Plant has been greatly increased through improvement and rehabilitation of facilities and installation of production economies.

Mr. E. F. Early has long been associated with Wickwire Spencer, is General Superin-

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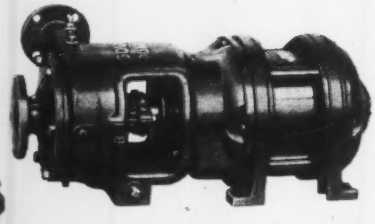
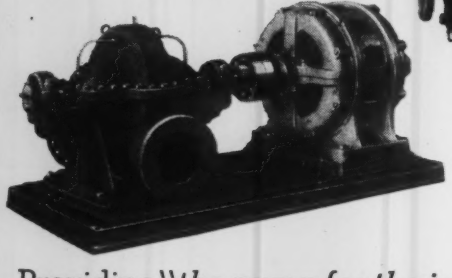
No. 3620. "Close-Cupld" Centrifugal





No. 3450. Double-Suction Single Stage Centrifugal

Providing "*the pump for the job*" has been the business of Goulds for more than 96 years. Goulds specializes in pumps only . . . building all types, centrifugal, rotary and reciprocating in a wide range of capacities and sizes.

Now, though we are engaged in production of pumps for war, we are able to furnish pumps on priority, and to discuss with forward looking companies the pumping requirements they anticipate for their peacetime activities—and to recommend "*the pump for the job.*"

If your postwar plans or your present essential production requirements involve questions of liquid moving, now's the time to see how Goulds can answer them.

Goulds PUMPS INC.
SENECA FALLS, N. Y.

• Keep Informed

tendent at the Morgan Plant of the Company in Worcester, Mass. This division of Wickwire Spencer manufactures springs, formed wires and bright wire goods and is one of the most efficient operating units.

Mr. Dunlap and Mr. Early will continue their present duties and responsibilities with the Company.

At the Annual Meeting of the Wickwire Spencer Steel Co. yesterday, the present Board of Directors was continued in office for the succeeding year. The members are Charles Allen, Jr., Franklin Berwin, E. C. Bowers, Frederic G. Coburn, Carl I. Collins, E. Perry Holder, Jacob L. Holtzmann, Samuel D. Lunt, Russell B. Stearns, and Cecil P. Young.

Mr. E. Perry Holder, Wickwire Spencer President, outlined at the Annual Meeting the Company's five-year rehabilitation and improvement program which is already in operation and producing results which justify the most optimistic outlook and forecast for the future. Stockholders present were unanimous in their approval of the present management's policies and method of operation.

Albert P. Leonard Appointed Manager Farrel-Birmingham New York Office

Farrel-Birmingham Co., of Ansonia, Conn. and Buffalo, N. Y., announces the appointment of Albert P. Leonard as manager of its New York office to succeed Edward S. Coe, Jr., who has been transferred to the main office at Ansonia as assistant to the plant manager. The company is also moving its New York office from 79 Wall St., where it has been located many years, to 3700 Chrysler Building.

Mr. Leonard comes to his new post with a broad and extensive experience in the engineering field, particularly in the sugar industry in which he has spent nearly a quarter of a century in various engineering, operating, and administrative posts.

Mr. Leonard was born in Syracuse, New York, a descendant of old American families going back to colonial times. After completing two years at McGill University in Montreal, Canada, his father's death placed upon him the burden of the family support. While working as draftsman and engineer he completed his engineering education at the Brooklyn Polytechnic Institute. For ten years preceding the first world war he worked for the Honolulu Iron Works Co. in the New York office and the field, starting as cub engineer and working up to assistant chief engineer. During the world war he was employed by the War Department in airplane engineering and production. From the 1918 armistice until 1930 he was associated with the Rionda Interests, in charge of the engineering department handling the work for five sugar factories. In addition to designing equipment and laying out complete plants, he also spent much time in Cuba and other West Indies sugar producing countries in operating and administrative capacities.

Besides his work in the sugar industry, Mr. Leonard has also been associated with several engineering concerns in other fields. As head of the Steam Division of the Contract Engineering Department of the Foster Wheeler Corp., he handled contact work with customers. He also spent several years as head of the Boiler Division of the Engineering Department of the Fidelity & Casualty Co. of New York, and prior to that was chief engineer of the Canadian branch of the Babcock and Wilcox Co., in charge of the engineering of steam boilers and heat recovery equipment, steam turbines, steam engines, compressors, pumps and other powerhouse machinery.

Continued on page 44

THEY'RE TOUGH . . . THESE 125 lb. GATE VALVES

125 lb. S.P. Bronze Gate Wedge Disc, Non-Rising Stem

125 lb. S.P. Bronze Gate Double Disc, Rising Stem

And they're proving it...in exceptional lasting qualities ...in dependable performance under trying conditions ...in less attention and fewer repairs...in short, in all the ways that add up to better service and a saving of time, labor and expense.

The extra strength built into these tough bronze valves comes in good stead in withstanding the punishing demands of continuous operating schedules. The simplicity of design and precision interchangeability of parts makes servicing easy and speeds maintenance.

Figures 2125 and 2129 (illustrated) are typical examples of Lunkenheimer correct engineering—carried through in a complete line of bronze, iron and steel valves, for all prevailing pressures and temperatures.

Lunkenheimer products are available from distributors everywhere. One of these distributors is near you to assist you with your maintenance and operating problems. His complete facilities and wide experience are at your call.

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• LATEST CATALOGS

New Purger Bulletin

An eight-page bulletin describing Armstrong non-condensible gas purgers for removing air and other non-condensibles from refrigerating systems has just been published by the Armstrong Machine Works, Three Rivers, Mich. Typical subjects discussed include: the effect of excess head pressures on power costs; causes of high condensate pressures; sources of non-condensible gases; how to tell when purging is needed, etc.

The bulletin also includes the operating principle of the Armstrong purger, installation diagrams, cross-sectional views, users' reports, and installation pictures, prices and physical data. Copies are available on request to the manufacturer.

Steam Jet Vacuum Pumps

Steam Jet Vacuum Pumps—Full detailed descriptions of Schutte & Koerting single- and multi-stage steam jet vacuum pumps, in many sizes and types for low and high vacuum work, are contained in a new 36-page bulletin, No. 5-EH. Full color sectional drawings show features of construction and principles of operation. Characteristics of various types are outlined and typical applications are shown. Copies can be obtained from Schutte & Koerting Co., 12th & Thompson Sts., Pniladelphia 22, Penna.

Steel Ball Manufacture

"How in the world do you make them 'round'?" is an almost universal question of visitors to New Departure's ball bearing plants at Bristol and Meriden, Conn.

To answer this suitably a new booklet has been issued entitled "Making Them 'Round.'" By profuse illustrations and clear simple text this subject has been made plain—and very interesting.

A copy may be had by addressing Advertising Department, New Departure Div., General Motors Corp., Bristol, Conn.

Air Conditioning, Refrigeration and Space Heating

New, condensed catalog AC-161—on Air Conditioning, Refrigeration, and Space Heating, 12 pages, size $8\frac{1}{2} \times 11$ in. Information is presented in concise hand-book style for quick reference in selecting air conditioning apparatus and related equipment to perform a required function efficiently and economically. Sections are: air conditioning, air distributing systems, refrigeration, and industrial heating and ventilating. Under these headings are listed 16 general sizes and types of building space, with a typical installation to solve each problem illustrated and described. Unusual feature is a bibliography of special publications and magazine articles which analyze in detail the factors influencing proper choice of equipment. Items in the bibliography and copies of the catalog itself may be obtained by writing Carrier Corp., Syracuse 1, N. Y.

Liquid Screens

A new, 8-page, illustrated Book No. 1977 on Liquid Vibrating Screens for recovering waste products and effectively reducing pollution, is announced by Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia (40).

Originally introduced by Link-Belt for removing cuttings, shale and sand from rotary oil well drilling mud, it is said that hundreds of these screens are now in successful use in this service, as well as in extracting solids from industrial waste waters, sludge, sewage, oils and other liquids.

In many of these installations, the screen has reduced stream pollution, in addition to recovering solids that are being made into valuable by-products.

In other installations, as with copra, cottonseed, fish and linseed or soy bean oil, both the solids and oil are recovered.

The new book contains numerous photographs of actual installations, and gives construction details, dimensions and weights of

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RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

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the various sizes of screens available for this type of service.

A copy of new Book No. 1977 may be obtained by writing direct to Link-Belt Co. at Philadelphia, Chicago, San Francisco, or other office of the company.

Motors for Motor-Driven Machinery

G-E motors designed to be of particular advantage to the machinery manufacturer are featured in a new 20-page bulletin (GEA-4092) recently issued by the General Electr ic Co.

Illustrated throughout, the bulletin gives complete information, including dimensions, on many different mechanical mounting arrangements possible with G-E horizontal and vertical, complete and partial, integral and fractional-hp, standard and special motors. Machine designers faced with the problem of fitting motors on machines will find this bulletin particularly helpful.

Information on WR^2 inertia calculation and on shell-type or shaftless motors has also been included in this bulletin.

"Manganese Steel and the Oil Industry"

"Drill stem bushings catch a four-letter word beginning with 'h' while holding the drill stem in place on a rotary table. The two part bushing is set in place around the square shank of the stem and is retained by a master bushing in the table." Such is the leading paragraph of an article entitled "Drill Stem Bushings of Manganese Steel Lower Oil Well Drilling Costs" which appears in Bulletin 244-P just released by the American Manganese Steel Div. of the American Brake Shoe Co., Chicago Heights, Ill.

This booklet is called "Manganese Steel for Oil Field Service" and is devoted to informative material for the men who sink and operate oil wells. Another article by F. L. Spangler and reprinted from "Product Engineering" is a technical treatment of the subject of sheaves for wire rope in the oil industry.

Other articles are "Amsco Manganese Steel Crown and Casing Block Sheaves", "Amsco Manganese Steel Sprocket Wheels" and "Manufacturers of Crown and Traveling Blocks Use Manganese Steel Sheaves." There are items dealing with the importance of design and material used in the construction of materials handling pumps and citing Amsco-Nagle pumps as especially adapted for petroleum refineries and similar applications.

Included in the interesting text is an article on how Amsco came to establish a foundry at Los Angeles to serve the oil fields. Among the profuse illustrations is a whole page devoted to views of apparatus in the Metallurgical Research Laboratory at Mahwah, N. J. Copies of this bulletin will be mailed gratis on request.

Compressors and Vacuum Pumps

Ingersoll-Rand announce a new 32-page catalog of compressors and vacuum pumps in sizes from $1/2$ to 10 horsepower. This bulletin covers the well-known Type "30" line of air-cooled machines with two notable additions, a 3-stage dual-pressure portable and two 3-stage high-pressure units. The dual-pressure portables are designed particularly for use at airports in the servicing and repairing of airplanes. They may be operated either at 80 to 100 lb. discharge pressure, or 1600 to 2000 lb., the manipulation of a single valve changing from one pressure range to the other. The high-pressure units are 3- and 4-cylinder machines producing discharge pressures of 3000 lb. and 2000 lb. respectively and are designed for

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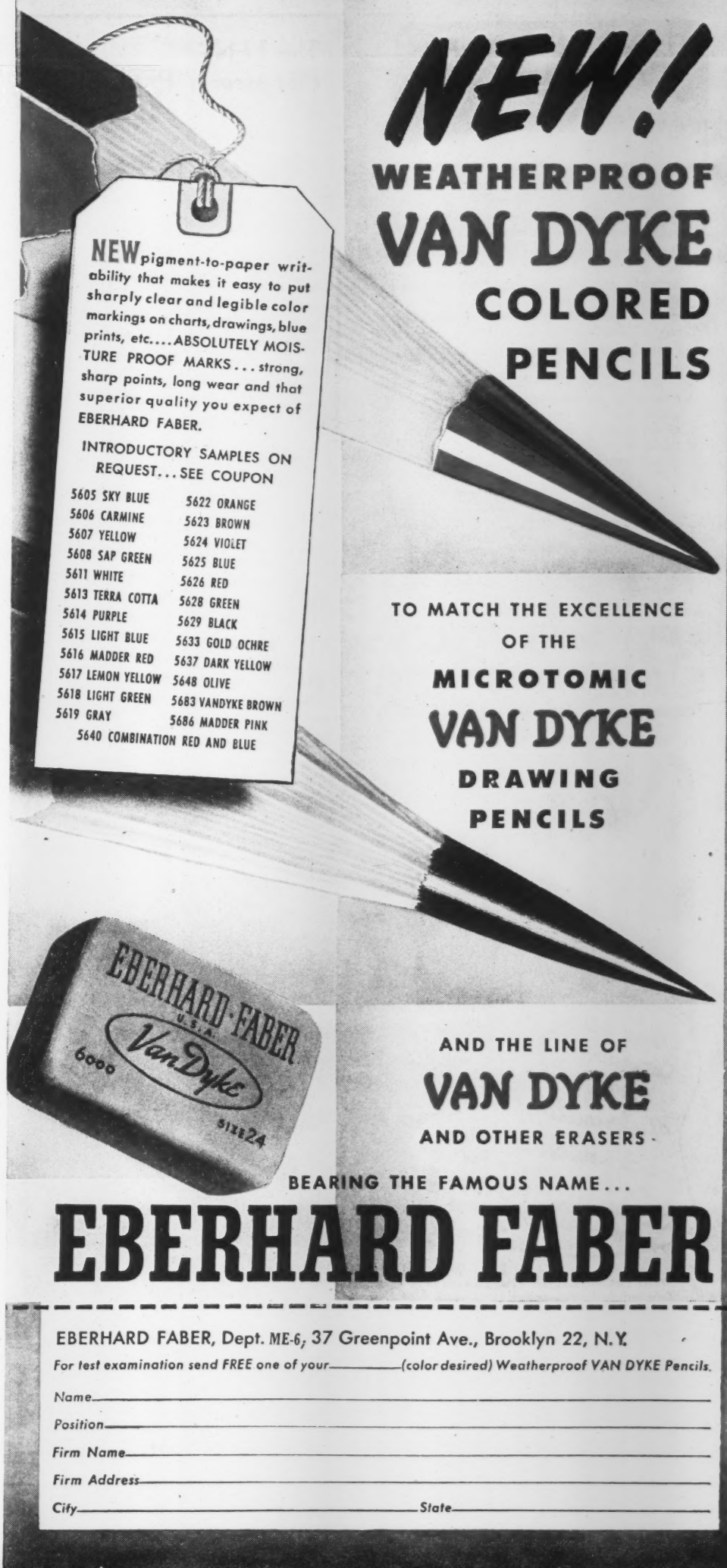
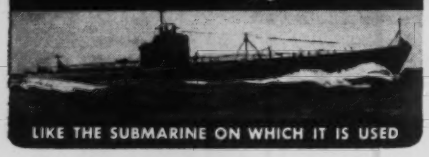


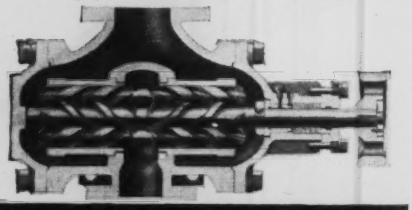
The IMO OIL PUMP
Small but Effective



LIKE THE SUBMARINE ON WHICH IT IS USED

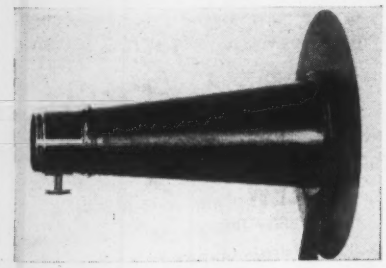
The submarine represents the most concentrated power known to naval warfare. Similarly, the IMO oil pump provides great concentration of pumping capacity in small space. It is extremely compact, rugged, simple and reliable, having only three moving parts and no valves or pilot gears.

The IMO oil pump is used on submarines for pumping both fuel and lubricating oils. You can use this small, but effective, pump for handling oil of practically any viscosity, in any volume, and at any pressure. Ask for Leaflet I-112.

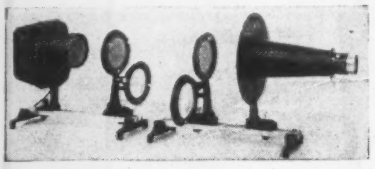


IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton 2, New Jersey

The LENS
that assures PRECISION



For either qualitative or quantitative photo-elastic analysis, perfection in the projection lens system is of major importance.



In our new model polariscope of 4¼" clear aperture, the parallel beam is collected by a rear element and condensed through a three component lens of the Cooke system. In the new larger unit (8¼" aperture) a four component lens of the Omnar system is used. *The image is sharp throughout the field, free of aberration, astigmatism, and distortion.*

Literature of new model polariscope now available

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HEAT EXCHANGERS

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special industrial uses requiring such pressures for intermittent operations.

There are six pages of excellent installation views showing various applications. The table of contents is ingeniously arranged in the form of a chart which enables the reader to select the proper compressor for a given pressure and capacity. A number of cross-sections are given to show construction details and there are three pages of accessories and special purpose units. A few paragraphs are devoted to a brief résumé of the company's 70-year compressor experience, their large, modern plant, and their superior service facilities, made possible by a country-wide system of branch offices, warehouses and industrial distributors.

The catalog may be had by writing the company at 11 Broadway, New York 4, N. Y., or one of its branches, for Form 1502.

Manual on Blind Riveting

A new manual on Cherry Blind Rivets, No. B-44, has just been issued for distribution to riveters, inspectors, field repairmen and for all other users of Cherry Blind Rivets.

This 36-page manual is unusually complete and profusely illustrated in color sketches, diagrams and tabular material. The manual covers the following general headings: description of the blind rivet,

COMING MEETINGS AND EXPOSITIONS

During the next three months

JUNE

5–7	Society of Automotive Engineers, National War Materiel Meeting, Book-Cadillac Hotel, Detroit, Mich.
5–7	American Society of Refrigerating Engineers, William Penn Hotel, Pittsburgh, Pa.
5–9	A.S.M.E. Aviation Division Meeting, University of California, Los Angeles, Calif.
16–17	A.S.M.E. Applied Mechanics Division Meeting, LaSalle Hotel, Chicago, Ill.
19–21	American Society of Agricultural Engineers, Annual Meeting, Schroeder Hotel, Milwaukee, Wis.
19–22	The American Society of Mechanical Engineers, Semi-Annual Meeting, William Penn Hotel, Pittsburgh, Pa.
21–22	National District Heating Association, Annual Meeting, William Penn Hotel, Pittsburgh, Pa.
22–25	Society for the Promotion of Engineering Education, Netherlands Plaza Hotel, Cincinnati, O.
26–30	American Institute of Electrical Engineers, Summer Technical Meeting, Jefferson Hotel, St. Louis, Mo.
26–30	Forty-seventh Annual Meeting, American Society for Testing Materials, Waldorf-Astoria, New York, N. Y.

JULY

19–21	American Society of Civil Engineers, Annual Convention, Hotel Cleveland, Cleveland, Ohio

AUGUST

29–Sept. 1	American Institute of Electrical Engineers, Pacific Coast Technical Meeting, Los Angeles, Calif.

For Calendar of coming A.S.M.E. Meetings see page 431 in the editorial section.

Keep Informed

drilling of the hole, selecting the rivet and pulling head, operation, installation procedure, tools and inspection technique.

All the phases of the Cherry Rivet process are explained in detail. Cherry Rivets are extremely easy to install and have wide tolerances in grip length and hole size for a blind rivet. The few simple rules to be followed are clearly presented in graphic form in this new manual.

Write to Cherry Rivet Co., 231 Winston St., Los Angeles 13, California, for a free copy. Specify Manual B-44.

Industrial Jacks

The new 60-page catalog and manual of Simplex Lever, Screw and Hydraulic Jacks, No. 44, has just been published and is available from Templeton, Kenly & Co., 1020 S. Central Ave., Chicago (44), Ill.

Pictures, descriptions, dimensions, capacities and weights of hundreds of jacks in sizes from 3 to 100-tons capacity and approved under Government Limitation Order L-322 are fully detailed in this book.

Also contained are operating and maintenance instructions on all types of industrial jacks.

Feature pages show jacks in war applications and lists of jacks by types for ready reference.

G. E. Releases "The Story of the Turbine"

Part of the series of booklets dealing with the history of the General Electric Co., its research and engineering activities and its contributions to American progress, a 24-page illustrated "Story of the Turbine" has been released by the Company and is being offered to the general public.

The publication, GEB-129, is a summary of the highlights in the development of the steam turbine that today produces most of the nation's electric power and drives many of America's naval and merchant ships. Written primarily for the layman, the booklet includes little technical discussion. It is, rather, an explanation of the place the turbine is now filling in war production and will fill in America's peacetime living.

"The Story of the Turbine" is available from the General Electric Co. at Schenectady, New York.

Diamond Flexible Shaft Couplings

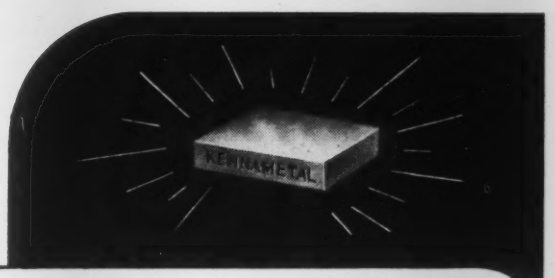
Flexible Shaft Couplings are described in the revised edition Bulletin No. 12 by the Diamond Chain & Mfg. Co., Indianapolis 7, Indiana. The advantages of this type of Diamond Roller Chain Coupling are explained and many applications shown. Horsepower rating and dimensions as well as enclosing casing dimensions and weights are given with prices for both Couplings and Casings.

Micromax Condensate-Purity Instruments

Anyone in steam plant or process industry who is concerned with preventing contaminated condensate from reaching boilers and prime movers, and who does not have Leeds & Northrup Co.'s catalog, "Micromax Condensate-Purity Instruments for the Steam Plant", should be interested in the 23-page revised edition of this publication just issued.

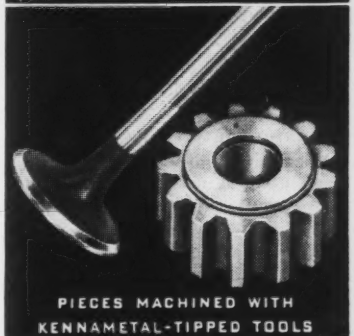
Embodying only minor changes in text, the catalog describes how condensate is sampled continuously by means of a conductivity cell, and its purity indicated and recorded automatically by means of a Micromax recording instrument. When contamination is present, the recorder can flash a signal or sound an alarm so that the operator can correct

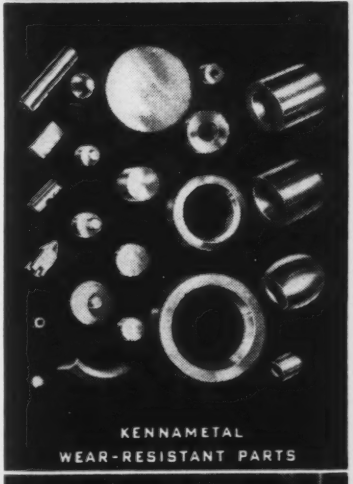
Continued on page 48



This unique piece of metal

KENNAMETAL-TIPPED TOOL - STYLE NO. 12


PIECES MACHINED WITH KENNAMETAL-TIPPED TOOLS


KENNAMETAL WEAR-RESISTANT PARTS

KENNAMETAL INSERTS ON TABLE GRINDER

. . . SOLVES MACHINING PROBLEMS . . .

"Too tough to machine, too hard to work"—time and again these words by production men sounded the death knell of designers' specifications. That is, until the discovery of Kennametal, the unique cemented carbide composition whose amazing hardness immediately established it as a tool material that makes practically any metal easy to cut. Kennametal-tipped tools swept away traditional machining limitations—making practical the cutting, boring, and milling of materials up to 550 Brinell at speeds that multiply output, and substantially reduce production time and costs. This application of Kennametal is a tremendous aid to better machine design, since it permits the use of tough, hard, lighter-weight parts instead of cumbersome components that were incorporated primarily because of their "machinability." Write for our Catalog 43-C that describes Kennametal tools. Study it with your production men—learn how to use the most advanced metal-cutting technique to improve your designs.

. . . IMPROVES PRODUCT PERFORMANCE...

Incredibly hard Kennametal (80.6 on the Rockwell C scale) delights designers who have been plagued by machine failure caused by abrasive or corrosive wear. Kennametal is up to 250 times as wear-resisting as steel. Its use at strategic points nullifies effects of friction and corrosion, assuring lasting precision performance. Complete Kennametal parts can be manufactured by us for use in your machines. Or —inserts of Kennametal can be easily incorporated into wear-areas. They are supplied . . . (1) accurately formed to desired shape, for brazing and finish grinding in your shop . . . (2) mounted on parts furnished by you, after which finishing is done either by you or by us . . . (3) embodied in complete parts produced by us. Don't let "wear" worry you —write us about your problem, and we'll show you how Kennametal can solve it.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

the condition. Instead of operating a signal, or in addition to operating one, the Micromax instrument can (if so equipped) control a valve and automatically divert contaminated condensate to waste. A simple L & N Signalling Conductivity Controller, which neither indicates nor records—just signals and controls—also is listed in this publication for the first time.

Write for Catalog N-95-163, "Micromax Condensate-Purity Instruments for the Steam Plant", Leeds & Northrup Co., 4934 Stenton Avenue, Philadelphia 44, Penna.

Save and Serve Plan for Proper Industrial Lubrication

The Sun Oil Co., 1608 Walnut St., Philadelphia, Pa., is offering to industry a Save and Serve plan through proper lubrication in industry. It is a complete program to help save industry time, machines and labor and thus increase production.

The purpose of the campaign is to provide maintenance data on proper lubrication . . . prolong the life of machines . . . conserve labor by increasing production per unit . . . and save time by reducing "down time" for repairs.

The complete campaign includes the following printed pieces which are available to all manufacturing industries adopting the plan. . .

"*Lubrication Booklet*" which describes the basic do's and don'ts of industrial lubrication and the handling of petroleum products.

"*Wall Chart*" containing all of the points in the booklet in briefed form. This chart is to be posted on bulletin boards where maintenance men and machine operators can read it.

"*Plant Poster*" driving home the value of proper lubrication and how each and every one can help Save and Serve. To be placed in strategic points throughout the plant where every employee can see it.

"*Industry Folders*" giving actual case histories of the savings attained by the application of proper lubricants. These folders will supply actual proof of the value of proper lubrication in each particular industry . . . evidence of how to Save and Serve.

"*Technical Bulletins*" giving engineering information on the application of lubricants to various types of industrial machinery. These include information on air compressors, hydraulic installations, refrigeration, and general industrial equipment.

"*Maintenance Memos*" to aid maintenance men of industry will be mailed to key personnel periodically. The subjects will be an exchange of useful information obtained in the field . . . and answers to current problems.

Complete and detailed information on this campaign may be obtained by writing direct to Sun Oil Company, Dept. 24, Philadelphia 3, and requesting the campaign prospectus. It gives a detailed description of each part of the "Save and Serve" Campaign and tells how to obtain a supply for your plant.

Fulscope Pneumatic Set Controller

A new descriptive bulletin, No. 98159, on the Fulscope Pneumatic Set Controller has just been issued by the Taylor Instrument Cos. It covers both the uses and the operating principles of the instrument.

In applications where a temperature, a pressure, a rate of flow, or a liquid level must automatically conform to changes in another variable related to the same process, Pneumatic Set offers a versatile, highly responsive control which reduces the adverse effects of time lag and load change.

Pneumatic Set is available in either single duty recording or indicating forms, single or double record, single or double indication. It may be ordered with any of the standard forms of Fulscope Control; Fixed High Sensitivity, Adjustable Sensitivity, Adjustable Sensitivity with Pre-Act, and Adjustable Sensitivity with Automatic Reset and Pre-Act.

Bulletin 98159 is liberally illustrated with photographs and simplified application drawings. Address requests for copies to the Taylor Instrument Cos., Rochester, N. Y.

"Jaeger" Speed Indicator

James G. Biddle Co., has just issued Bulletin #1750 describing "Jaeger" Speed Indicator which is a new instrument recently produced for the first time in this country.

This instrument is for measuring locational and surface speeds of various kinds of mechanical equipment and does so with excellent precision.

Pressure Vessels, Plate Fabrication, Steel Boilers

Union Iron Works, Erie, Pa., has just issued a bulletin on pressure vessels, plate fabrication and steels boilers. Text matter is largely devoted to showing the modern manufacturing methods employed by this company in making the above products, such as bending rolls, hydraulic presses, special stress relieving furnaces, and the uses of X-Ray equipment to make exographs of welded seams. Union products are used in synthetic and natural rubber manufacture, magnesium, high explosive, aluminum, pulp and paper, high octane gasoline and other industries.

Here's a Pump that's "Ambidextrous"

TUTHILL

Automatic Reversing Pump Delivers From Same Port Regardless of Direction of Shaft Rotation.

Reversing shafts can't stump this Tuthill Model R Pump. You can drive it in either direction of rotation without changing the flow of the pumpage. It requires no check valves. It automatically solves the problem of driving a pump from a reversing shaft and provides the answer where the ultimate direction of shaft rotation is not known. These internal-gear rotary pumps are available in sizes from 1 to 50 g.p.m. and pressures up to 100 p.s.i. Write for complete catalog.

Tuthill Pumps are Serving Army • Navy Air Force Merchant Marine

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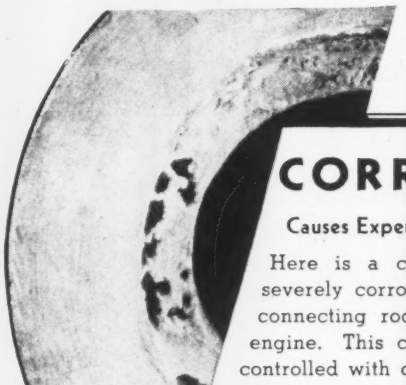

CORROSION

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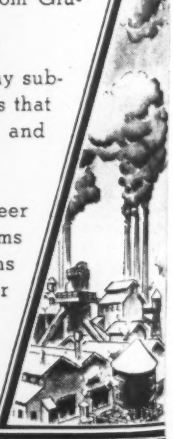
Here is a cross section of a severely corroded water cooled connecting rod of a large gas engine. This corrosion can be controlled with our Chrom Glucosates.

This is but one of the many subaqueous corrosion problems that are solved by Haering and Company daily.

Let a Haering field engineer survey your corrosion problems and submit recommendations without any obligation on your part.

Write for "Scale and Corrosion Control in Aqueous Systems."

We Read Water



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• Keep Informed . . .

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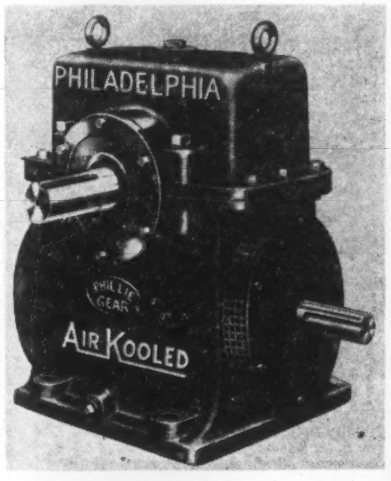
- *BUSINESS CHANGES*
- *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

New AirKooled Worm Gear Speed Reducer

The New Philadelphia AirKooled Worm Gear Speed Reducer, made by Philadelphia Gear Works, Erie Ave. and G Street, Philadelphia, Pa., offers considerably greater horsepower ratings than the standard heavy duty type unit for worm speeds of 580 to 1750 r.p.m. At 1750 r.p.m., the ratings are approximately doubled at all ratios.

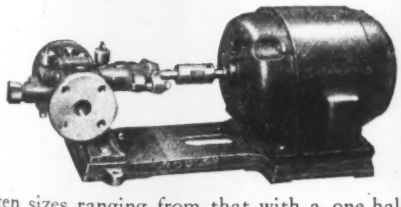


Horsepower ratings of standard worm gear units at higher worm speeds are limited due to the rise in temperature of the oil bath. The AirKooled unit dissipates this heat by drawing cooling air through the double walled ribbed housing with a suction fan mounted on the worm shaft.

At 1750 r.p.m., where the rating advantage is greatest, the AirKooled unit will be about two sizes smaller than a standard unit of the same capacity, resulting in a great saving in space and approximately a 40 percent reduction in weight.

Goulds Announces New Line of Rotary Pumps

Goulds Pumps, Inc. of Seneca Falls, N. Y., have just announced the addition of a new line of rotary pumps of the double helical or herringbone gear type which are designed to handle liquids which possess inherent lubricating qualities. The pumps are available in



ten sizes ranging from that with a one-half inch suction and discharge and with a capacity of from one to one and one-half GPM to the two and one-half inch type with capacity ranging from fifty to seventy-five GPM. Maximum working pressures in all sizes is given as 75 lb. All sizes are obtainable for direct drive through flexible coupling or for belt drive.

Features of the new rotary pumps include their simplicity of construction involving but two moving parts, a split bolted type gland, renewable bearings and built-in relief valve. All are exceptionally quiet in operation.

The rotors are accurately bored and pressed onto the shaft. The driven gear is of bronze while the driving gear is of steel held by a key.

Bearings are of high lead bronze fitted with grease lubricators. The extra deep stuffing box is fitted with metallic packing. The bronze gland is split in halves for easy removal and is held together by two fitted bolts.

The relief valve of the stainless steel ball type is built into the pump cover and is externally adjustable.

In addition to the standard fitted type all pumps are also available with all parts of iron or steel or in all bronze construction.

Complete descriptions and specifications of the new line of rotary pumps are contained in Goulds Bulletin No. 643, copy of which may be obtained by writing Goulds Pumps, Inc., Seneca Falls, N. Y.

Taylor Process Timing Mechanism

The Taylor Process Timing Mechanism for Fulscope Temperature or Pressure Controllers, production of which was suspended soon after the beginning of the War, is again available. This will be welcome news to batch process industries such as canners, vulcanizers, etc., the quality of whose products depends upon positive time control of either temperature or pressure.

This device is built into either the single duty Fulscope Recording Temperature or Pressure Controller and functions as follows. The process is started manually by adjusting the instrument for the desired time period. Timing begins, not immediately, but when the apparatus reaches the desired control point, no matter how long or short a time that may take. At the end of the timed period the Process Timing Mechanism automatically ends the process.

Several variations of the instrument are available so as to assure maximum usefulness over a wide range of specific applications. Because it is designed for use in the Fulscope Case, the user enjoys the advantages of the five interchangeable forms of Fulscope Control, Fixed High Sensitivity, Adjustable Sensitivity, Adjustable Sensitivity with Automatic Reset, Adjustable Sensitivity with Pre-Act, Adjustable Sensitivity with Pre-Act and Automatic Reset. The Taylor Instrument Companies, Rochester, New York, will furnish details upon request.

Heavy Duty Steel Heater

A new heater for heavy duty applications in industrial heating, air conditioning, vapor absorption, drying and other processing work has been announced by B. F. Sturtevant Co., Hyde Park, Boston, Mass. These heaters possess the maintenance and repair free advantages of the old pipe coil heaters combined with the performance of modern heating surface which has an increased heating capacity of 10 times due to the addition of fins to the heater pipes.

Above: Complete unit. Right: Cross-section showing header and inner tube construction

Sturtevant Heavy Duty Steel Heaters are constructed of 1″ standard steel pipe threaded into cast iron headers. Inside these pipes are $^{3}/_{8}$″ steel pipes which carry the steam from the header, distribute it uniformly to all heater pipes, prevent air binding and provide a non-freeze characteristic.

Wound around the heater pipes are spiral fins made of soft carbon steel strip $^{9}/_{32}$″ wide and tapered from .085″ thickness at the edge attached to the pipe to .012″ at the outside edge. The tapered construction of the fins provides greater heat transfer than with the usual fin of uniform thickness. Absence of crimping also effects marked reduction in resistance to air flow. After assembling, fins and pipes are passed through a metallic bath which assures permanent bonding between pipe and fins, and protects against corrosion.

Each finned pipe is anchored at one end only, permitting pipes to expand and contract freely, independently of each other. Pipe alignment plates at extreme end, and also at center of all heaters with pipe lengths in excess of $6^{1}/_{2}$ feet insure correct spacing, prevent sagging and assure uniform air flow.

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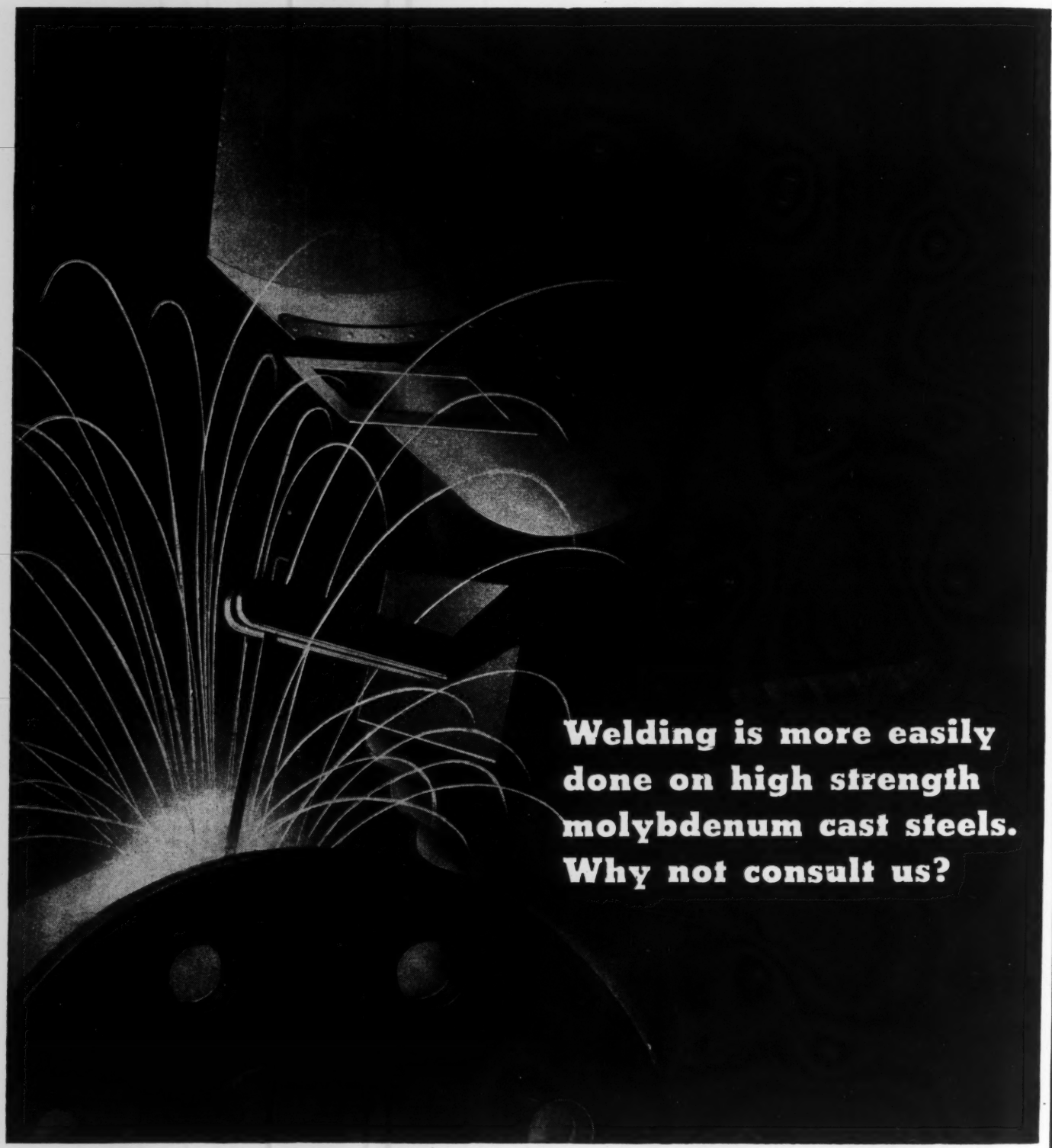

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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Climax Molybdenum Company

500 Fifth Avenue · New York City

MOLY

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All heaters are subjected to a 600 lb. hydrostatic test and to 200 lbs. under steam. Heaters will be tested at 1000 lbs. hydrostatic pressure if requested.

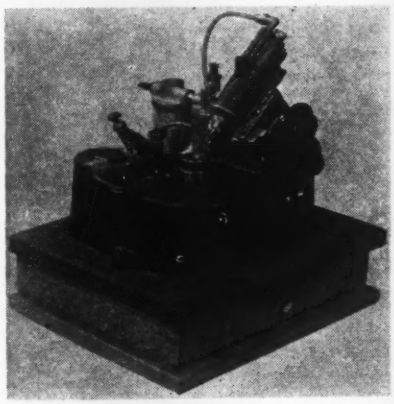
Standardized steel casings, of heavy gauge galvanized steel, die formed for strength and uniformity are fitted with flanges, template punched, to facilitate assembly to other sections and to duct connections.

Four sizes of Sturtevant Heavy Duty Heaters are available—20″, 25″, 30″ and 35″ in width across the pipes. Each size can be furnished with pipe lengths from 2 to 10 feet in 6″ increments.

A 32-page catalog containing construction details, capacities, dimensions, piping and installation data will be sent by B. F. Sturtevant Co. on request.

Special Machine Speeds Up Precision Grinding of Diesel Fuel Injection Valve Seats

The Cooper-Bessemer Corporation's need for a fast method to replace the hand lapping of the needle valves and valve seats in the fuel injection system of Diesel engines was not answered in a readily available grinder of sufficient accuracy, so a machine was designed and made in the company's development laboratory.



Carl Mahaffey, development engineer for Cooper-Bessemer, has designed and completed the construction of this grinder after many months of experimentation. The performance of the grinder has enabled these valve seats to be turned out in quantity and with such precision that hand lapping is unnecessary.

The machine itself is powered by two air motors, one to drive the grinding tip and one to revolve the valve seat.

In the above illustration will be seen the motor, for driving the grinder, mounted at the angle of the seating surface of the valve base. The motor for driving the valve seat is enclosed and can be identified by the top-plate fastened by screws seen at the left.

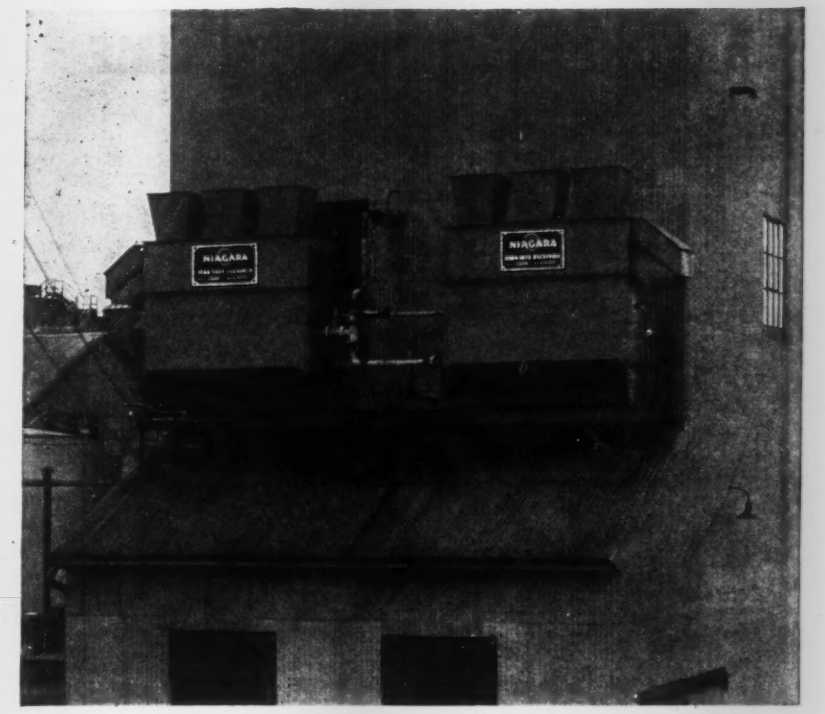
The valve seat is held beneath the knurled chuck seen immediately in line with the grinder shaft and is turned in the opposite direction to the grinding motion.

The driving air motor is of conventional design and is lubricated by a filter feed attached to the air line. The compressed air connection can be seen center-left of the illustration on the air filter, mounted in series with the oil filter, which is partially hidden by driving motor housing.

Another unusual feature of the Cooper-Bessemer valve seat grinder is the tool dressing point which is made a part of the unit. In the illustration can be seen the diamond point tool dresser which is swung

Continued on page 30

For Lower Costs and Dependable Results in LIQUID COOLING



● Wherever there is a need for the use of cooling water or the cooling of any liquid to exact temperatures, the NIAGARA *AERO* HEAT EXCHANGER provides a more accurate control and lower costs for cooling. Refrigeration is not needed.

These results are advantageous in all types of water-jacketted and water-cooled equipment; for example, they have solved for many the troubles coming from excess water and oil in air compressor lines. Other uses include the cooling of diesel engines and hydraulic equipment; also chemicals and intermediates requiring cooling or controlling temperatures in chemical processes.

In addition, wherever used, it saves practically all the expense of cooling water and the cost of piping, pumping and extra equipment. Users have cut such costs as much as 95%.

Write for complete information

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INDUSTRIAL COOLING • HEATING • DRYING
HUMIDIFYING • AIR ENGINEERING EQUIPMENT

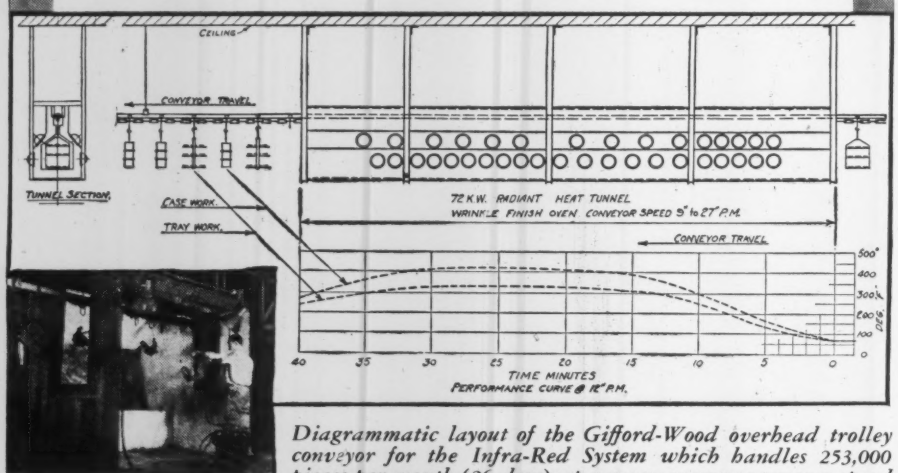
G-W INFRA-RED SYSTEM REDUCES DRYING AND FINISHING TIME BY 50%

Consider these facts from a recent case history. Gifford-Wood was asked to design a system to coordinate infra-red drying with conveying operations to finish 23,000 aircraft instruments in 400 working hours per month.

Designed, built and installed by G-W engineers, the system is now in operation and finishes 253,000 individual parts each month of 26 working days—in 332 hours.

This G-W system reduces manpower by 66⅔%, and production time by 50% over old methods, by permitting *continuous* processing of the instrument parts *while in transit.* Operations cover degreasing, finishing and infra-red convection drying of prime and finish dip or spray coatings.

More than 30 years' experience in creating and installing mechanical handling systems for all industrial applications gives authority to the advice of Gifford-Wood engineers on Planned Conveying. Write Dept. M for Bulletin 150, or for an appointment with a G-W representative to discuss your problems.



Diagrammatic layout of the Gifford-Wood overhead trolley conveyor for the Infra-Red System which handles 253,000 pieces per month (26 days) at a mean average conveyor speed of 18 inches per minute. Photograph shows spraying unit of Infra-Red System in operation. Parts rotate as they pass through the drying tunnel.

5782

GIFFORD-WOOD CO.

FOUNDED 1814

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Ash Spouts • Barge Unloading • Bins • Boiler House Equipment • Buckets • Bunkers • Carriers
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Hoppers • Infra-Red Drying Systems • Screens • Silo Storage Plants • Tanks • Weigh Larries

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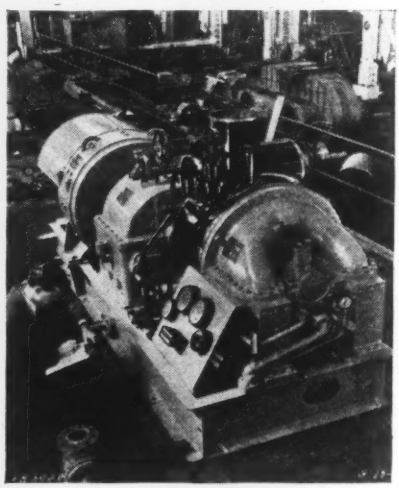
around into contact with the grinding tip when dressing is necessary.

This Cooper-Bessemer production tool is typical of many engineering accomplishments contributing to the high efficiency of the company's diesel engines. It is particularly important since the fuel injection system constitutes the real heart of diesel performance and anything which improves the dependability and accuracy of fuel injection improves also the overall efficiency.

New Turbo-Generator Announced by Hendy

Although a kilowatt is a kilowatt, whether delivered in Chungking, China, or Potlach, Idaho, there's a world of difference between the machines that produce it. In developing the new Hendy Turbo-generator, the engineers of the Joshua Hendy Iron Works, Sunnyvale, Calif., have built a unit whose differences place it well ahead of other plants in the marine auxiliary power field. These differences add up to new economy of operation and high over-all efficiency.



The Hendy organization has been favored with a number of advantages in the development of its new turbine generator. An engineering staff of ranking men had been attracted by its war assignments, which included the building of engines for more than one-third of the Liberty ship fleet, the construction at an unprecedented pace of 4000-hp and 8500-hp steam turbines for the U. S. Maritime Commission's cargo vessels, and the manufacture of many other essential power units.

The spirit of new enterprise has been added to such material advantages as thousands of new square feet of plant space and hundreds of new machine tools. New standards of workmanship have been established. New methods of manufacture, new assembly techniques, and even new machine tools to do the job better and faster have been developed. New records have been established, as a result, in the mass production of prime movers. All of this has been carried over into the building of the new turbo-generator.

In starting production of a new line, Hendy did not have the handicap of a standardized manufacturing method. The new turbo-generator was perfected by a process of bringing together the best ideas of design and construction and then improving and adding to them in the light of experience gained from the manufacture of other types of precision machinery. Hendy's claims to leadership for its new power plant stem from the proven ability to produce high-quality power products in a variety of other fields.

Built for war service, the new auxiliary power unit had to meet the exacting requirements of the U. S. Navy and the Maritime Commission Standardized Specifications. Its basic design covers a wide range of output, starting at 250 KW.

The modern trend toward simplification has been followed throughout in the designing of the turbo-generator. The lines of the entire unit are clean with a smooth exterior.

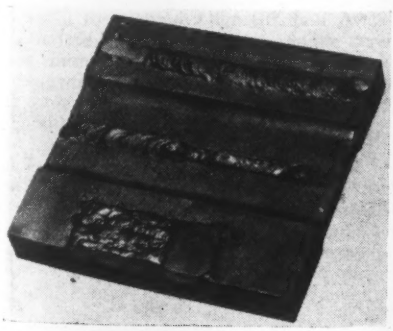
The turbine has an economical water rate per kwh, thus insuring low operating cost. The backbone of the turbine is the large-diameter spindle with disks having large hub sections, assuring greater strength. Interstage seals are of the stop-cut labyrinth type. The steel Rateau nozzle disks have welded-in, rolled stainless-steel nozzle blades and spacers. The governing system uses anti-friction bearings and is without stuffing boxes or soft packings, assuring accuracy and simplified control. Smoothness and compactness of design have been achieved without sacrifice of accessibility.

The reduction-gear case is of fabricated steel, smoothly finished with rounded corners. Rigidity is combined with light weight in its construction. External piping has been reduced to a minimum. The generator field yoke is formed of rolled steel plate, split on the horizontal centerline with the halves bolted together. It is of shockproof construction, which assures greater safety under adverse conditions. Its liberal dimensions provide capacity for emergency overloads, maintaining high efficiency throughout. The shaft bearing is of the sleeve type, mounted in a self-aligning spherical seat, insuring alignment. Sixty-six years of generator-building experience are back of this generator.

The construction features of the Hendy turbo-generator are those normally found only in larger units. Thus larger factors of strength and safety, more economical operation, and higher over-all efficiency are achieved.

New Developments in Metallic Arc Welding of Aluminum

Whereas gas welding of aluminum has been possible for quite some time, the use of the metallic arc process for welding aluminum sheet tubing and, particularly, castings, was not as successful as the metallic arc welding of steel.



The research Department of the Eutectic Welding Alloys Co., New York, is pleased to announce a new electrode with a new coating which can now be used with great ease in the welding of aluminum sheet and castings. This new rod, known as EutecTrode 2100, opens a new field for arc welding—the salvage and reclamation of aluminum castings. It is possible, with this new electrode, to add metal without completely preheating the casting, and particularly without danger of overheating the metal adjacent to the weld. The operation is extremely rapid, thus very economical and renders the salvage of defective castings a simple and very inexpensive procedure.

The new rod has shown itself to be extremely successful in the addition of metal on faulty or improperly machined castings, overlaying of surfaces which have been improperly cast, filling of "low spots", changing of aluminum patterns already machined, filling of faultily-drilled holes, filling and overlaying of porous castings, and welding of casting to aluminum sheet.

Another field where the appearance of this new electrode will greatly simplify and speed up work is in the joining of aluminum sheet. The extremely high rate of fusion of this new type of rod produces a smooth, strong, homogeneous fillet with great speed, avoiding distortion and stresses. Joints can be obtained which are entirely leakproof and which are machinable and show high tensile strength comparable to the parent metal.

The rod is shielded with a special coating which permits its application even without preheating. It insures an even and rapid flow of metal and the slag can be removed by simply wire brushing the weld.

EutecTrode 2100 is a high aluminum and low silicon composition which alloys itself

Continued on page 32

IF "PREPARING FOR PEACE"
★ includes Pumps ★
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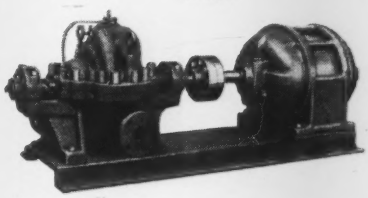
Fig. 3380 2 stage opposed impeller type centrifugal.



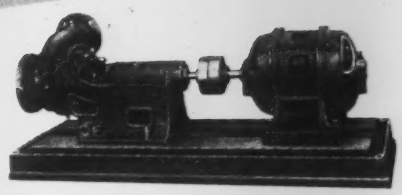


Fig. 3720 Single stage enclosed impeller direct connected centrifugal

Many users of pumps bring their entire liquid handling problem to Goulds. They know that from Goulds they get unbiased recommendations for *the pump for the job.* And usually they can get that pump from Goulds whether the one best suited is reciprocating, rotary or centrifugal, whether 5 g.p.m. or 16,000 g.p.m., because Goulds makes them all.

If you are "preparing for peace" and your plans include pumps, we are ready now to discuss those plans with you and share with you what we have learned about better and more efficient ways to solve pump problems.

If your products or services are directly connected with the war effort, Goulds Pumps are *available now* on priority. A statement of your highest available priority will enable us to quote best possible delivery.

Goulds
PUMPS INC.
SENECA FALLS, N. Y.

to practically every type of aluminum. Thus, it can be used for practically all aluminum jobs. EutecTrode 2100 is available in 1/8", 5/32" and 3/16" sizes and is recognized by a long blue tip. Material is available for prompt delivery. It is packed in packages of 25 lbs.

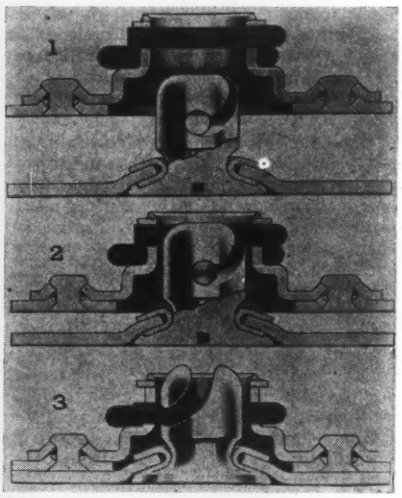
Technical Data on Esna's New Spring-Lock Fastener

The ESNA spring-lock fastener, newest addition to the self-locking Elastic Stop Nut and other aircraft fittings produced by Elastic Stop Nut Corp., is the result of more than ten years of research and investigation for a quick-acting fastener with the qualities needed for use on the cowling of high-speed airplanes. A catalog showing complete specifications, sizes available and detailed tests has just been prepared and can be had by writing the company's Union, N. J., office.

Thousands of tests, both by the company's own laboratories and by independent research units, proved that it meets the fullest requirements. It has been accepted for use on production of aircraft and for maintenance by the U. S. Army Air Forces, by the U. S. Navy Bureau of Aeronautics, by the Department of National Defense for Air for the Dominion of Canada, and by the Civil Aeronautics Administration for the U. S. Department of Commerce.

The spring-lock fastener is composed of two parts, both of them installed permanently on the fixed part as well as the removable part of the cowling or other assembly, thus avoiding any possible chance of losing either part.

The stud end of the fastener is placed in position with the body of the fastener, as shown in the illustration. When the two parts are shoved together, the stud cam-slot makes contact with the spring cross-bar section. The stud is then turned less than a quarter turn, so that the stud cam picks up the spring-cross-bar, pulling it down until it has passed the crest of the cam and snapped into locked position.



The simple, quick-acting method of locking the new ESNA Spring-Lock Fastener is shown here. The stud end of fastener is shown in position with body (1). Figure 2 shows the stud cam-slot making contact with the spring cross-bar section, and Figure 3 shows how, with less than a quarter turn, the cam picks up the spring cross-bar, pulls it down past the crest and snaps it into locked position.

The No. 7 Fastener has a specification torque maximum of 18 inch-pounds, with tests showing that it averages under 15 pounds locking torque, and under 12 pounds in unlocking. The average man can exert a 20 inch-pound force with a disc the size of a quarter, and 50 inch-pounds with a screwdriver. Tension requirements better the Government specifications of 50 pounds with a sheet separation of not over .003 inches.

Sheet separation tests require the same fastener to support a load of 700 pounds, with a sheet separation of no more than .046 inches; and the tension overload requires that it support a load of 150 per cent of its rated tensile strength which, for the No. 7 Fastener, is 1050 pounds.

Shear tests for the same fastener demand the support of a load of 700 pounds without permanent set; and that it hold a load in shear of 1050 pounds without failure. The vibration tests show that it withstands five hours of vibration without load, and 25 hours supporting a 225-pound load, at a frequency of 3600 cycles per minute, with an amplitude of 1/16 inch.

In endurance, after being vibrated for 30 hours, the fastener must stand 40,000 cycles of lock and unlock operation at 110 cycles per minute without failure. The fastener can be installed on sheets bent to a radius of curvature of 18 inches.

For postwar use, the spring-lock fastener will furnish quick accessibility for servicing

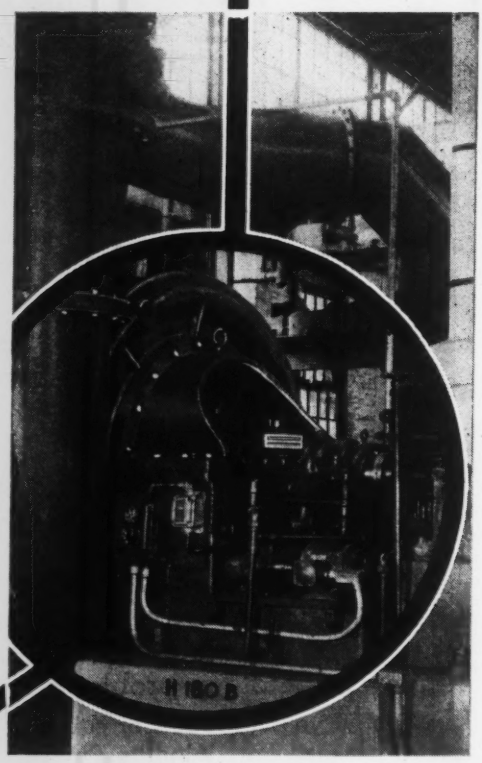
UNEXCELLED DESIGN
Proved by
High Efficiency Performance

While the basic principle of all makes of centrifugal blowers and exhausters is the same—there is a difference in how they are designed and manufactured.

Roots - Connersville Centrifugal Units have that built-in "extra" which is reflected in their *consistent* record for more than meeting the performance promises, plus long-lived, smooth operation. They clearly show the characteristics of expert design backed up by 90 years of manufacturing experience, plus modern facilities and skilled workmanship.

Where high efficiency, dependability, and long life are the major considerations, the performance of "R-C" units is winning leadership in the centrifugal field. Write for your copy of our latest Bulletin 120-B-12.

ROOTS-CONNERSVILLE BLOWER CORP.
407 Michigan Ave., Connersville, Ind.



"R-C" steam-turbine-driven Centrifugal Gas Exhauster installed in an Eastern manufactured Gas plant. Capacity 19,000 c.f.m., speed 4,750 r.p.m., pressure 3 lbs.

Roots CONNERSVILLE SINCE 1854
Centrifugal EXHAUSTERS

★ BONDS BOUGHT TODAY Help Win Beachheads Tomorrow ★

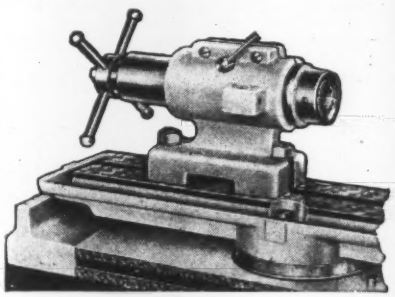
• Keep Informed

and adjustment, give lifetime use without annoying failures, make possible streamlined appearance on parts that must be readily accessible, and prevent rattling of panels because they can be held tight by predetermined spring pressure.

The fastener can be furnished in any required metal, under the standard specifications of Elastic Stop Nut Corp. products, or on special order.

New Tap Grinding Fixture for Use on All Tool Grinders

The K. O. Lee Co. of Aberdeen, South Dakota, is now in production on a new Tap Grinding Fixture, adaptable to any make tool grinder. The unit is compact, sturdy, handy, and of latest design. Maximum accuracy is maintained on taps through the use of collets. This fixture is built to accommodate taps from No. 8 to $2^1/_2$ inches in diameter.

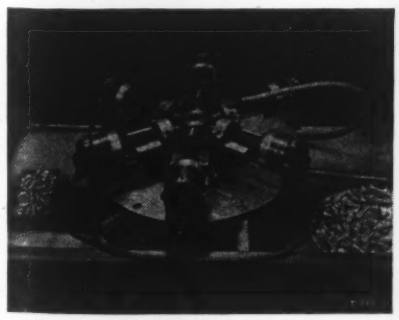


All grinding operations necessary on taps can be accomplished with one set-up; these include grinding the relief, grinding the flutes, and salvaging broken taps. Two, three, four, five and six flute taps can be ground either right or left. T-Slot blocks to fit any make tool grinder will be furnished on request.

Four outstanding characteristics distinguish this new grinder fixture: 1. It is designed correctly by engineers with years of experience. 2. It is a fixture designed for a specific purpose—not an adaptation to a job. 3. Simplicity of operation enables tool room workers with little experience to do fine finish grinding on taps. 4. It is economically priced for what it is built to do.

Illustrated literature just off the press is yours by writing to the K. O. Lee Company of Aberdeen, South Dakota, and requesting bulletin No. 33TE.

Zagar Multiple Collet-Holding Fixture



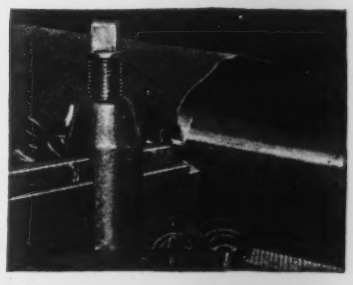
The Zagar multiple collet-holding fixture is the latest addition to the Zagar line made by Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio. Its main purpose is to step up production in war plants. It answers the many requests of users of standard single Zagar Holding Fixtures for a fixture with greater working capacity on large mill-

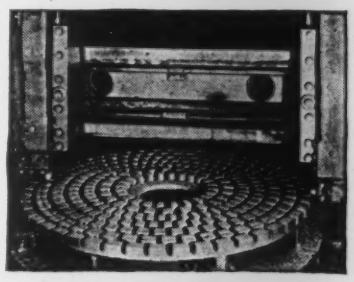
Continued on page 34

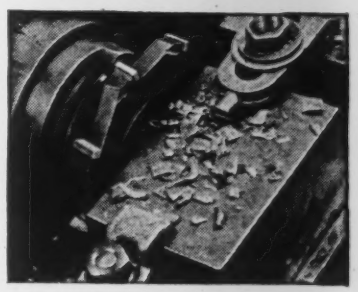
Cost—in the over-all terms of man-hours, materials, and machines invested—is the most important factor in either wartime or peacetime production. War goods produced economically help save the lives of our fighting men, hasten the successful conclusion of hostilities, counteract inflation, will ease the transition from war to peace. Peacetime goods produced economically help more people enjoy the benefits of better things at less cost.

Are you effecting machining economies? If you use Kennametal-tipped tools, the answer is—*Yes*. Kennametal is the unique cemented carbide composition—discovered, developed, and produced in America. Kennametal-tipped tools cut and mill metals 2 to 6 times faster—remove 10 to 50 times the metal before the tool must be resharpened—last up to 20 times as long as former tools—produce a smooth, accurate finish that reduces grinding and polishing operations—in many cases eliminate expensive and time-consuming annealing operations by machining steel in the hardened state. Their use multiplies the capacity of available equipment—means utmost productivity per man, per machine, per unit of power consumed.

Kennametal-tipped tools are available for lathe, boring mill, and milling machine operations on steels up to 550 Brinell, cast-iron, and non-ferrous materials. Switch to Kennametal today to cut metals—and most important, to cut costs.







KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

ing machines. It makes possible numerous set-ups which boost output with accuracy.

The multiple fixture consists of four Zagar Holding Fixtures in either the 1″ or 2″ size. They can be mounted either parallel with or at right angles to the spindle. Two, three or four collets can be used, or multiples thereof.

An indefinite number of multiple fixtures can be used at once, the only limit being the length of the table. Center to center of collets is $3^1/_2$″ on the 1″ fixtures and $5^1/_2$″ on the 2″ fixtures. Two fixtures can be staggered, however, reducing the distances to $1^3/_4$″ and $2^3/_4$″, respectively. Where the miller is equipped for climb-cutting, two fixtures can be mounted on each side, making a total of 16 collets on one set-up.

The fixtures have all the advantages of the well known Zagar Holding Chuck. The design is extremely simple, making mastery easy for beginners. There is nothing to get out of order. Rugged construction gives long service. Chip trouble is eliminated by forcing the coolant upward, washing the chips away. Standard Zagar set-ups cover a surprisingly wide range of jobs, special tooling being seldom necessary. Prompt deliveries are being made.

New Small Capacity Twin Pumping Unit

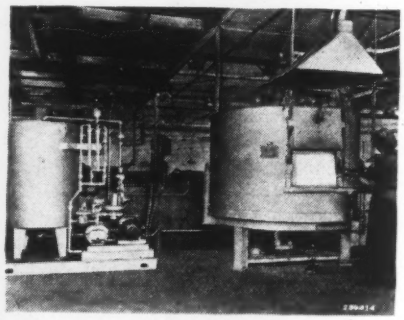
Design and operating data on a new twin pumping unit has recently been released by J. B. Trotman, General Sales Manager of the Blackmer Pump Co., Grand Rapids, Michigan.

The specifications of the new unit are as follows: Two standard Fig. 4202, No. 50 pumps mounted on a cast bedplate and connected through semi-enclosed reduction gears to an electric motor. Pump constructions available are all-iron, bronze-fitted or all bronze. Capacity of each pump is 3 GPM at a discharge pressure of 100 psi. Pump speed is 570 RPM. Unit is designed to handle fuel oil, lube oil and similar liquids.

These units will later be available in larger capacities and high pressures for industrial applications where it is desirable to handle two different liquids through the same pumping unit simultaneously. Similar twin units are now available with clutches to permit either alternate or simultaneous operation of pumps.

Continuous Furnace Heats Parts That Require Individual Handling

A large Western aircraft manufacturer operates Westinghouse rotary hearth furnaces for hardening parts that must be handled individually for fixture quenching and with no scale or decarburization.



The furnace capacity is just sufficiently large to keep one furnace operator busy and to harden up to approximately 400 lbs of work per hour. One operator performs the charging, discharging, and quenching operations. Preference of the rotary furnace over box type furnaces was made due to the increased production per man, more accurate control of the heating cycle, and decrease operating cost.

The furnace is especially easy to operate as the hearth rotates automatically and there is one door which is air operated by means of a foot control valve. Heating cycles can be varied to suit the size of pieces to be hardened and a time clock rings a bell alarm to notify operator when work arrives at door to be removed and quenched.

The furnace shell is made gas tight for using Endogas atmosphere to prevent decarburization and to heat parts clean and free from scale. A high velocity flame curtain prevents air entering the heating chamber when the door is opened.

The photograph shows a rotary furnace installation with an Endogas generator.

Inserted-Blade Cutters

Kennametal Inc., Latrobe, Pa., announce a line of inserted-blade cutters, known as Kennamills, for step-milling of steel. These new cutters are available in four sizes: 2″ with 3 blades; 3″, 4″, and 5″—each with 4 blades. The 2″ and 3″ sizes have taper shanks to fit 40 and 50 spindles; the 4″ and 5″ sizes have taper shanks to fit 50 spindles only. All sizes use the same standard replaceable Kennametal-tipped blades (Cat. No. 39M40). Two sets of blades are supplied with each cutter head. To facilitate immediate delivery, Kennamills are stocked at Kennametal offices in Atlanta, Chicago, Detroit, Houston, Los Angeles, Philadelphia, New York, and San Francisco.

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Design, construction and installation of complete plants and projects

Mechanical, Heavy Industries, Shipbuilding, Hydro-Electric Developments, Power Plants, Chemical and Refining Plants, Process Industries, Metallurgical Developments and Processes, Explosives, Plastics, Water Supply and Treatment, Sewage and Industrial Wastes Treatment.

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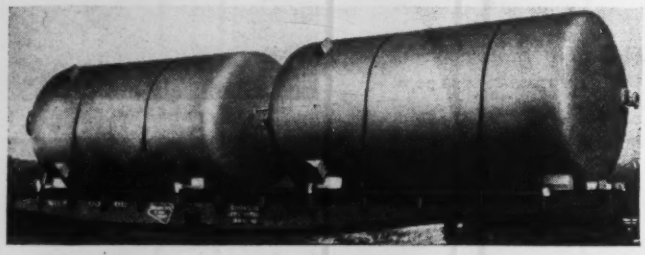
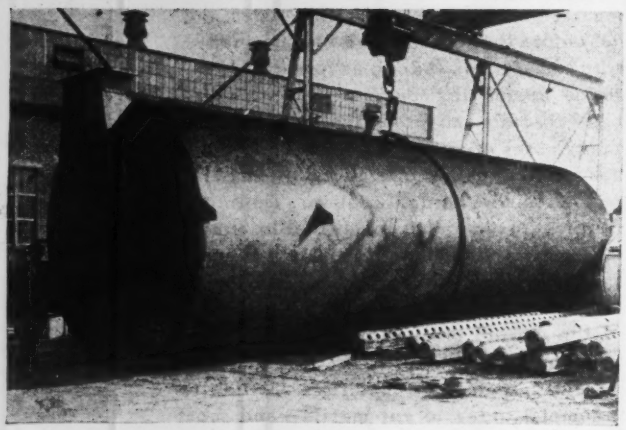


A GOOD NAME

. . . AND A GOOD PRODUCT



THE name Downingtown in Steel Plate fabrication has long been synonymous with right design - - - right materials - - - good workmanship - - - thorough experience - - - fair price. Heat Exchange Equipment is a specialty. Prompt attention to all inquiries and orders. Send for our 32-page Fabrication Book *free*. Request it on your business letterhead please

DOWNINGTOWN IRON WORKS
DOWNINGTOWN, PA.
WELDED and RIVETED PRODUCTS

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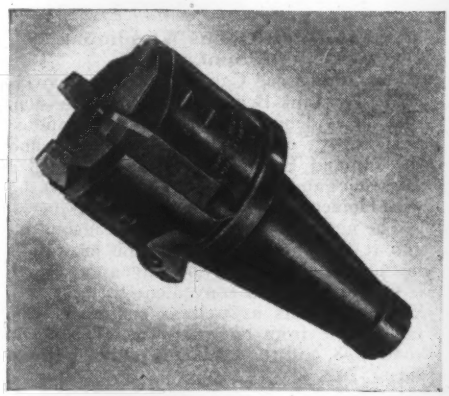
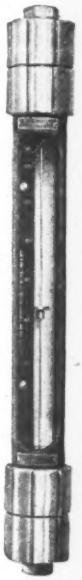
Kennamills permit high-speed carbide milling of steel with the same smoothness of operation attained with multiple blade cutters, yet they are as simple to maintain as fly cutters. Tool and cutter grinders are not necessary, since the blades may be removed from the cutter head and resharpened to a template on a simple adjustable table carbide grinder. Accurate resetting in the head is not necessary as each blade cuts an independent path.



Similar designs of cutters with one or two Kennametal-tipped blades were improvised during the past four years for fly-cutting of steel. In numerous shops they have permitted rapid, high quality work even by inexperienced operators. The new Kennamills are a distinct advancement in fly-cutter milling technique, since on cuts of over 1/4" depth the horsepower available on modern milling machines can be fully utilized. Work is distributed among the greater number of blades, and load on the machine thereby smoothed out. For complete information request catalog on Kennamills from Kennametal Inc., 367 Lloyd Ave., Latrobe, Pa.

New Line of Rotameters



Several important features claimed to be exclusive are listed by Cochrane Corp., of Philadelphia, in announcing Series R-100 Rotameters. These meters are of the indicating area meter type, covering sizes from 1/8" to 3", with both free and guided floats. Floats may be viscosity or density compensated. Metering tubes are of extra heavy wall Pyrex borosilicate glass formed on mandrels, annealed, polariscope inspected and check-gaged by precision ball test. Features include: (1) Spring Stop Floats, to prevent damage to float by sudden surges of liquid. (2) High pressure stuffing boxes, permitting use of corrosive liquids under high operating pressures. (3) Single external adjustment of stuffing boxes by wrench, instead of taking up successively a number of bolts or screws. (4) White-backed metering tube for easy reading. (5) Interchangeable calibration scales for quick and inexpensive change from one service to another. (6) Constant tension guide rod is anchored in ends of glass tube instead of in end fittings. It can therefore be more accurately centered and its tension will be unchanged by repeated stuffing box adjustment. (7) For test accuracy work, guide rod can be supplied with spring loading feature to secure ideal precision of alignment.

The Cochrane-Rotameter (Inc.) line of Rotameters covers: Free Float and Guided Float Types (260 mm. 10 in. Scale Length). Extra Length Guided Float Type (625 mm. 25 in. Scale Length), Dashpot Type for Pulsating Flows, Panel Mounting Type, Portable Type, Rotameters for Opaque Fluids, Rotameters for Vapors Containing Condensibles, Rotameters with Remote Indicators, Recorders, Integrators, Automatic Controllers and Automatic Proportioners. A catalog, Publication R-100 is available.

New Fluxmeter Announced by G.E.

A new light-beam-instrument for measuring either flux density or the total magnetic flux in magnetic circuits has been announced by General Electric's Meter Division. The instrument was developed by the General Engineering Laboratory.

The fluxmeter, applicable wherever permanent magnets or d-c electro-magnets are used, is similar to a light-beam galvanometer and has a suspension-type element. By using search coils, which can easily be constructed by the user, it provides a ready means of handling a wide variety of magnetic measurements. It can obtain different sensitivites by utilizing galvanometers of various characteristics. These galvanometers are interchangeable, and the instrument has a scale of 50-0-250 millimeters.

The control box, which contains a dry cell,

Continued on page 36

"WE READ WATER"

These are photographs of our new analytical and control laboratories where "we read water." Scores of water samples received daily are given careful and complete analyses under the most modern methods of determinations by graduate chemists. Our application of Chrom Glucosates to scale and corrosion control in cooling systems, boiler and water systems has brought such a response that it has necessitated these larger analytical laboratory facilities. Take advantage of these completely equipped laboratories and our highly trained staff to find the answer to your problems in scale, corrosion and algae. Write today for our booklets, or let a Haering Field Engineer call and study your problems without obligation.

1. Where samples are received, assigned numbers and recorded.
2. East bank of laboratory wells at analytical and control laboratory.
3. One side of the supply department showing a portion of the stock of basic chemicals required in making up testing reagents.
4. Balance and Microscope Room.
5. Where H-O-H Test Kits are assembled and sent to clients.

D. W. HAERING & CO., Inc.
GENERAL OFFICES:
205 West Wacker Drive, Chicago 6, Ill.

The **DE LAVAL ROTARY OIL PUMP** has only 3 moving parts, no gears, no valves and no separate bearings. It propels any grade of oil in any volume in a smooth, steady stream against any pressure, like a piston moving always in one direction. The IMO motor-driven pump here shown is one of five in lube oil service on each of the largest and fastest Great Lakes ore carriers.

Ask for Publication I-106

IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton, New Jersey

• Keep Informed . . .

resistors, rheostat, push button, and a switch, provides a means of introducing a voltage into the electric circuit to compensate for small but undesirable spurious voltages that may otherwise cause errors in high-sensitivity instruments of this type. Moreover, the control box provides a means of returning the spotlight index to the zero position after a measurement has been made.

This compact instrument for measuring magnetic fields which occur in research, testing and production work, depends for its operation on the use of a direct-current, moving-coil galvanometer of the "compensated" type. In this design, the restoring torque of the suspension is, for all practical purposes eliminated, resulting in a fluxmeter construction which is excellent for work with electric measuring instruments, communication apparatus, motors and generators and contactors and relays. After a flux change has been indicated, the light beam index remains at the point, giving ample time for accurate readings.

Bulletin GEA-4157, which describes the fluxmeter and fluxmeter galvanometers and includes drawings of search coils, is available from the Company at Schenectady, New York.

• BUSINESS CHANGES

Link-Belt Opens Warehouse in Spokane

San Francisco, Calif.—Announcement is made by Link-Belt Co., Pacific Division, that, as evidence of their faith in the industrial growth of the Pacific Northwest and the "Inland Empire," they have opened a sales office and warehouse in Spokane, Wash., with Homer A. Garland in charge.

The new address is South 151 Lincoln St., and it is pointed out that as this location is but one block south of the Davenport Hotel, it should be found convenient to local Spokane customers as well as customers who must come from out of town. The postal zone is #8, and the telephone number, Riverside 7574.

A representative line of power transmission, elevating and conveying equipment will be carried in stock, including such items as pulleys, V-belts, Ewart detachable and "H" Class chain, malleable iron buckets, "RC" flexible couplings, "RC" roller chain and sprockets, silent chain and wheels, motorized reducers, anti-friction bearings, babbitted bearings, take-ups, etc.

Eastern Washington, northern Idaho and a western portion of Montana will be served from the new office, and it is planned to enlarge both the space and warehouse stocks as conditions warrant.

Mr. Garland, a native of Manistique, Mich., has been associated with the Link-Belt organization since 1922, having in that year entered the employ of the company's Seattle warehouse. He has served the "Inland Empire" for quite a number of years, first traveling out of Seattle and since February, 1940, direct from his home in Spokane.

McFadden Appointed Allegheny Ludlum's Chicago Manager

W. G. McFadden, formerly Assistant District Sales Manager of the Allegheny Ludlum Steel Corporation's Chicago Office, has been appointed District Manager of that territory, according to Mr. R. M. Allen, Vice President in Charge of Sales.

Mr. McFadden was named Acting Manager in the Chicago Territory, during that period when Mr. P. E. Floyd was granted a leave of absence by Allegheny Ludlum's Board of Directors to serve the government on the War Production Board. Mr. Floyd has since assumed new duties as Assistant General Manager of Sales at Brackenridge, Pa., and Mr. McFadden has taken over the responsibilities of the Chicago District Managership, effective January 1, 1944.

Wickwire Spencer Steel Promotes Dunlap and Bussmann

Mr. E. P. Holder, President of the Wickwire Spencer Steel Co., announced today the promotion of Mr. R. T. Dunlap to the position of Vice President in Charge of Production. Also announced was the advance of Mr. A. G. Bussmann to the position of Assistant to the President.

Mr. Dunlap was previously Vice President and General Superintendent of the Buffalo District. Before joining Wickwire Spencer in 1943, he was General Works Manager of

"Periodic Re-tightening NOT Necessary with BOOTS NUTS," *say leading fleet operators*

Tested successfully by R. H. Macy & Co.

Proved invaluable by United Parcel Service

Endorsed by Metropolitan Distributors, Inc.

ACTUAL service tests have proved that this nut *can't* shake loose. With its built-in all-metal lock, the Boots Nut defies vibration. Once it locks itself in place, it *stays* tight! Yet the Boots Nut can be adjusted or removed, and re-used, time and time again. And, being *all metal*, Self-Locking Boots are not affected by oil, gasoline, temperature or weather.

For the duration, Boots' entire output must be reserved for military aircraft. After victory, the Boots Nut will be available to you to assure fewer repairs and better all-round performance.

BOOTS
SELF-LOCKING NUTS
"There's No Excuse for a Nut Shaking Loose"
Boots Aircraft Nut Corporation
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the Vulcan Iron Works at Wilkes-Barre, Pennsylvania.

Under his direction, the operating efficiency of the Buffalo Plant of the Company has been greatly increased through improvement and rehabilitation of facilities and installation of production economies. Mr. Dunlap will continue to make his headquarters in Buffalo.

Mr. A. G. Bussmann previously has been the Assistant to the Executive Vice President of Wickwire Spencer. He has been associated with the Company since 1930 and was successively Sales Manager of the Wire and Springs Divisions, Sales Manager of the Buffalo District, and General Sales Manager.

Mr. Bussmann has long been associated with the steel industry and before his connection with Wickwire Spencer was Chief Chemist of the Denora Steel Works of the American Steel and Wire Co. and President of the Standard Steel and Wire Co. of Greensburg, Pennsylvania. In his new position Mr. Bussmann will be located at the executive offices of the Company in New York.

Hanlon-Waters Elects Officers

M. F. Waters, President of Hanlon-Waters, Inc., Tulsa, Oklahoma, announced that at the annual meeting of the company held at Tulsa, February 22, Edward F. Deacon, President of Climax Engineering Co., Clinton, Iowa, and The McAlear Manufacturing Co., Chicago, Owen L. Coon, Chairman of the Board of General Finance Corp., Chicago, and James E. Allison, Attorney for the Hanlon Interests, were elected to the Board of Directors of Hanlon-Waters, Inc.

The old officers of the company, consisting of E. I. Hanlon, Chairman of the Board of Directors, M. F. Waters, President, and J. H. Boyle, Treasurer, were re-elected. J. E. Allison, Attorney for the Hanlon Companies, was elected Secretary. L. J. Griffey, who has been Chief Engineer of Hanlon-Waters, Inc. for ten years was made Vice-President and C. W. Snyder was appointed Chief Engineer.

E. I. Hanlon is Chairman of the Board of the National Bank of Tulsa and is a prominent figure in the oil industry.

Hanlon-Waters, Inc., manufactures automatic control equipment for use in the oil field, together with oil and gas separators and bolted tanks.

Climax Engineering Co. manufactures gas and Diesel engines, power units and generating sets.

The McAlear Manufacturing Co. manufactures automatic control equipment for the industrial steam power plant field.

The enlarged Board of Hanlon-Waters, Inc. will make possible the close association of the three companies in the post war period.

Wilson Named Manager Minneapolis-Honeywell Branch at Detroit, Mich.

Kentner L. Wilson has been named branch manager of the Minneapolis-Honeywell Regulator Co. Detroit office. His appointment became effective April 1st.

Mr. Wilson started with Minneapolis-Honeywell at its Minneapolis plant in 1931. When the Brown Instrument Co. became a part of the company, Mr. Wilson was transferred to the Brown division at Philadelphia where he spent three years. Following this he was named industrial manager in charge of Brown Instrument sales at Indianapolis, Ind., and for the past three years he has been industrial manager of the Brown division of Minneapolis-Honeywell at Cleveland, Ohio.

Continued on page 38

Practical Conservation of Metals with Amsco Welding Products . .

Welding engineers and welders have earned more credit than they have received in the metal conservation program. Many of them have been aided by Amsco Welding Products with which a little metal has often saved a lot.

Amsco Nickel-Manganese Steel Welding Rod for building up worn away portions of manganese steel and carbon steel parts requiring high tensile strength and ductility; and for tacking on and filling in around Amsco Filler Bars, Shapes and Repointers.

Amsco Mo-Mang Welding Rod for building up manganese steel and carbon steel parts subjected to impact and abrasion.

Amsco No. 459 Welding Rod for hard-surfacing parts subjected to severe abrasion and moderate impact.

Amsco No. 217 Welding Rod for hard-surfacing parts subjected to extreme abrasion, and abrasion at moderately elevated temperatures.

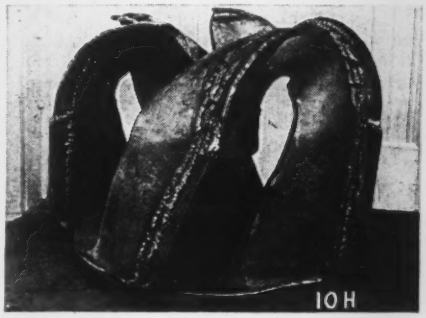
Amsco Economy Hardface for parts subjected to severe impact and abrasion.

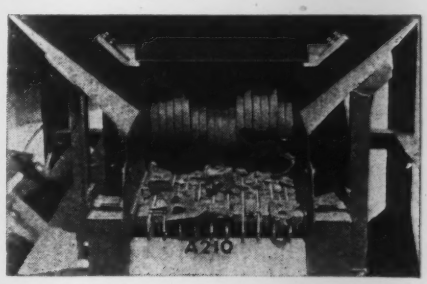
Amsco Dieweld for repairing forging dies, trimmers, punches; for making composite dies; for restoring worn edges of cutting tools and for tipping on a cutting edge on mild steel.

Amsco Nickel-Manganese Steel Filler Bars and Special Shapes for use where large amounts of metal are required to reinforce thin sections; also for repairing worn tractor treads or grousers.

Amsco Dipper Teeth Repointer Bars for quickly restoring worn manganese or carbon steel dipper teeth to original dimensions. Also used to add life to bucket lips, etc.

Ask for Bulletin 941-W on Amsco Welding Products.





Metal Savings Pictured

10-H—Dredge catterhead given added service life by building up the worn blades with Amsco Repointer Bars, welded on with Amsco Nickel-Manganese Steel build-up rod.

A-210—Periodic application of Amsco No. 459 Hard Surfacing Welding Rod more than doubled the service life of the walking grids of this Royer foundry shakeout unit.

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Chicago Heights, Illinois

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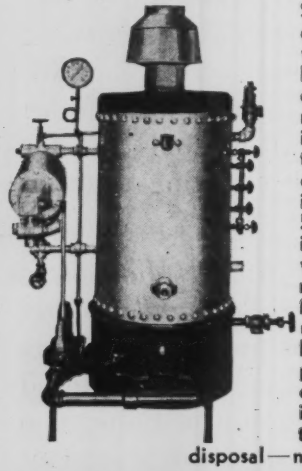

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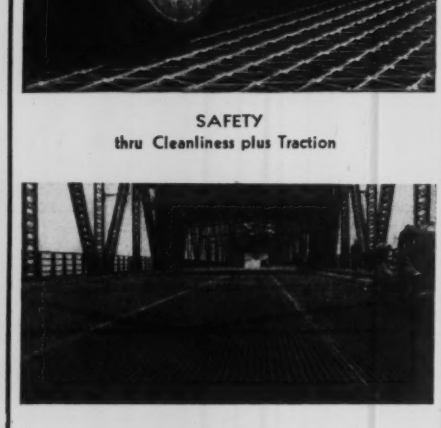

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Wing Appoints New Representatives

The L. J. Wing Manufacturing Co., New York, N. Y., manufacturers of heating, ventilating and combustion equipment, announces the appointment of the following new representatives: Glidden Engineering & Equipment Co., Dallas and Austin, Texas; E. Lloyd Widner, Knoxville, Tennessee; Babcock & Wilcox, Ltd., of Mexico, Mexico City; and Sergio Ortiz Toro, Caracas, Venezuela.

Hiermeier to Manage St. Louis Branch for Brown Instrument Co.

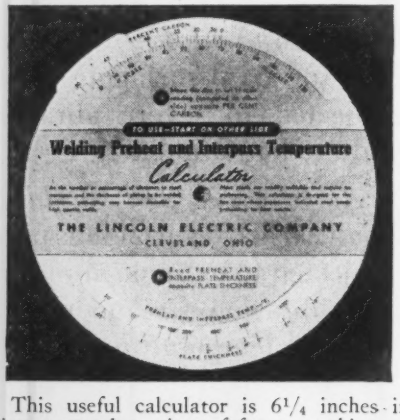
Philadelphia, Pa.—V. H. Hiermeier has been named industrial manager of the St. Louis office of the Brown Instrument Co., Philadelphia precision industrial instrument division of Minneapolis-Honeywell Regulator Co.

Mr. Hiermeier, who succeeds I. K. Farley, has had 15 years' experience in the industrial instrument field. For the past few years he has been with the Brown company in its Chicago office. Mr. Hiermeier is credited with doing much to help Purdue University establish and operate an instrumentation course.

• LATEST CATALOGS

New Lincoln Calculator Determines Welding Preheating Temperatures

A new calculator, designed for readily determining the welding preheating and interpass temperatures of steels in those few cases where experience indicates the need for preheating to obtain best welding results, has been announced by The Lincoln Electric Co., Cleveland, Ohio.



This useful calculator is 6¼ inches in diameter and consists of four movable sections of heavy cardboard stock. Complete instructions in the form of six simple steps are printed on the outside sections.

Although most steels are readily weldable and require no pre-heating because of low carbon and alloy content, this calculator will serve as a convenient guide in instances where steels have a higher content of carbon and other alloys and require preheating to minimize the tendency toward excessive hardening and possible cracking of the base metal adjacent to the weld.

The calculator, available through The Lincoln Electric Co., Cleveland, Ohio, is priced at 25 cents, postpaid, anywhere in the United States, ($.50), elsewhere.

Thy-Mo-Trol Drive

The Thy-mo-trol, G. E.'s pioneer electronic drive for providing and controlling adjustable-voltage power from a-c lines thus making possible the utilization of the inherent advantages of d-c motors, is described in an attractive new 40-page bulletin (GEA-4025) recently issued by the General Electric Co.

The bulletin, well illustrated throughout, is divided into two parts. The first part explains the unique Thy-mo-trol drive in con-

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RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

• Keep Informed

siderable detail, describes its functions, and lists its advantages. This section also lists many Thy-mo-trol applications and describes some of them. Typical applications listed include: installations on grinders, turret lathes, drill presses, conveyors, and form-and-thread milling machines; and to machines for testing tachometers, magnetos, propeller governors, and the tensile strength of various materials.

The second part of the publication is devoted to a complete, easily understood, technical explanation of the Thy-mo-trol drive's operation.

Micromax Rayotube Pyrometers

To show how war plants have been applying Rayotubes and Micromax equipment to important new temperature-measuring jobs, the Leeds and Northrup Co. has just revised its Micromax rayotube pyrometer catalog.

Embodying, in this forty-eight page edition, basically the same engineering descriptions as were presented in the 1941 publication, it includes for the first time equipment being used to measure the temperature of molten cast iron, electric salt pots and blast furnace stove domes.

The publication should be of special interest to anyone who may not have a copy of the earlier edition or to anyone who has use for the very latest information.

For a copy, write to Leeds & Northrup Co., 4934 Stenton Avenue, Philadelphia 44, Pa. Ask for Catalog N-33B—"Micromax and Speedomax Rayotube Pyrometers."

Apparatus and Chemicals for Water Analysis

A new 44-page booklet, profusely illustrated, presenting the various apparatus and chemicals which are used for Industrial Water Analyses for plant control has just been announced by W. H. and L. D. Betz, Gillingham and Worth Streets, Philadelphia 24, Pa. The book features the test sets required for such determinations as hardness, alkalinity, phosphate, sulfate dissolved oxygen, pH value, silica, and others. In addition, numerous comparators, photometers, turbidimeters and so forth are displayed.

The book "Apparatus and Chemicals for Water Analyses" should be in the reference library of every Plant Chemist, Power Plant Executive, Operating Engineer, or any others who are interested in the conditioning of Industrial or Municipal water. Free on request.

Type P Combustion Control

To describe its new system of combustion control designed especially for the smaller industrial or municipal power plant, Leeds & Northrup Co. has just issued a new catalog, "L&N Combustion Control, Type P".

This publication shows how the system regulates fuel-feed and draft by a simple electrical balance, varying the settings of valves, dampers or vanes in definite proportion to steam demand. At the same time, furnace pressure is automatically regulated.

The application of this system to different types of boilers . . . stoker fired, pulverized coal fired, gas fired, and oil fired . . . is shown in the catalog by schematic illustrations. Several typical installations are pictured. The electrical balance action and the control of furnace pressure are shown by means of photo-diagrams.

The publication also describes how the operator . . . without leaving the panel . . . can switch from automatic control to semi-automatic or can regulate any or all of the various drive units by push buttons. This

Continued on page 40

Announcing

A NEW WELDING PUBLICATION

THESE FEATURES EACH MONTH

★ Welding Metallurgy

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★ Salvaging Tools

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The EUTECTIC WELDER is prepared by the engineering and research staff of The Eutectic Welding Alloys Company, and supplemented by contributions from users of the process in all fields.

Welders, welding engineers, and metallurgists have acclaimed the arrival of The EUTECTIC WELDER. An engineer writes:

"Found your publication a real boon to our welding department. Please add the following names to your list and make sure to send us current issues every month."

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ndependent operation of the drive units is said to allow the controllers to be serviced without interrupting the operation of the boilers.

Because all equipment except drive units can be shipped, mounted and wired on one compact panel, installation of this Type P system, point out the makers, is reasonably simple.

For more complete information about this system for the smaller power plant, write for Catalog N-01P-163, "L&N Combustion Control, Type P", Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.

Tube Turns Pocket Data Chart

Tube Turns, Inc. of Louisville, Kentucky, has recently published a handy pocket-size dimensional data chart which gives complete quick-layout information on every Tube-Turn welding fitting and flange. Printed attractively in two colors these 9" x 24" charts are ideal for spreading out on a drawing board or desk, or they can be folded up like a railroad timetable into a 9" x 4" folder and slipped into a pocket. Just make the request on a company letterhead and one of these charts will be sent free of charge.

Fundamentals and Applications of Electronic Control

The fundamentals and the various applications of electronic control are interestingly described in a new 12-page bulletin (GEA-4126) recently issued by the General Electric Co.

Well illustrated, the publication explains n clear, simplified language the fundamental principles of electronic tubes and their operation, describes the construction of the well known thyratron tube, and lists the functions of eight of the more widely used industrial-type tubes.

The publication also describes and illustrates many practical applications of electronic control, including rectification, resistance welding, timing, and processing operations, as well as photoelectric installations, involving counting, sorting, weighing, measuring, registering, illumination, and the control of cement kiln temperatures. Many of these applications have been in successful operation for a decade or more.

Also listed in the publication are the various advantages afforded by the use of electronic control, such as flexibility, precise control, reduced maintenance, and quiet, faster, automatic operation.

Link-Belt "100" Belt Conveyor Idler

A new 16-page illustrated Book No. 1915 published by Link-Belt Co., Chicago, announces The "100" Link-Belt anti-friction idler for belt conveyors and gives detailed information on the various sizes available in the several types.

These types include troughed carrying-run idlers; flat-roll carrying and return idlers; troughed self-aligning idlers; and self-aligning return idlers. Dimensions, weights and list prices are given.

Features of the new "100" Idler include—1. A positive grease seal to keep the grease in and the dirt out of the anti-friction bearings. 2. Troughing rolls accurately aligned in a sturdy streamlined steel frame assembled in jigs to assure correct bracket spacing and roll interchangeability. 3. Roll shafts locked in frame, yet quickly and easily removed. 4. Interlocking nuts and yokes to keep roll supporting brackets from spreading. 5. Equipped with pipe extensions for safe center-roll lubrication from one end of troughing idler unit. 6. All rolls in each troughing idler are of same length and interchangeable.

The opening pages of new book depict Link-Belt belt conveyor progress through the years, showing drawings of conveyor idlers dating back to the year 1896. Twelve distinctly different designs are illustrated, alongside the year in which each was commonly used. The early-day idlers were indeed quite different.

A copy of new Book No. 1915 may be obtained from Link-Belt Co. at Chicago, Philadelphia, San Francisco or other office of the company.

COMING MEETINGS AND EXPOSITIONS

During the next two months

JULY

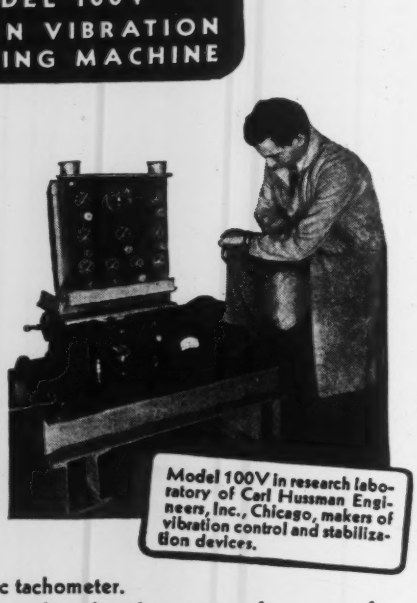
19–21 American Society of Civil Engineers, Annua Convention. Hotel Cleveland, Cleveland, Ohio

AUGUST

29–Sept. 1 American Institute of Electrical Engineers, Pacific Coast Technical Meeting, Los Angeles, Calif.

For Calendar of coming A.S.M.E. Meetings see page 493 in the editorial section.

New MODEL 100V
ALL AMERICAN VIBRATION FATIGUE TESTING MACHINE



Model 100V in research laboratory of Carl Hussman Engineers, Inc., Chicago, makers of vibration control and stabilization devices.

THE new Model 100V subjects parts or assemblies up to 100 lbs. in weight to exhaustive vibration fatigue tests. Drilled and tapped work table has 4-point support and area of 15" x 18". Vibration mechanism runs in oil—no cooling devices required. Total displacement: 0" to .125" (adjustable). Frequency of 10 to 60 cycles per second (600 to 3600 vibrations per minute) is adjustable, and is recorded on electric tachometer. Capacity 27 g. Strength combined with precision for years of constant service. Send for Catalog "F" showing our complete line of automatic and manually controlled units.

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V-BELT PUMP UNIT
MAKES LIGHT WORK OF
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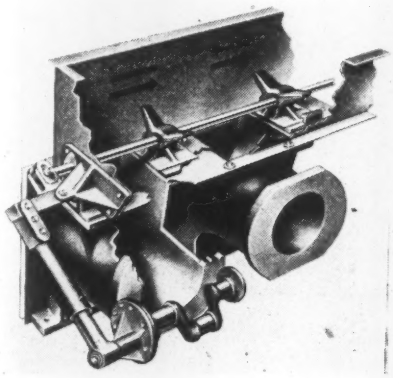
• *BUSINESS CHANGES*
• *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

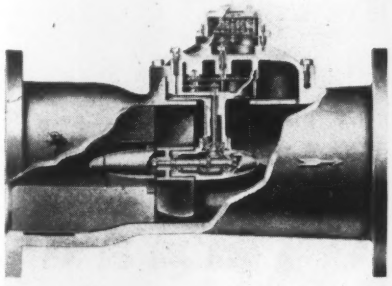
Coal Feed Agitator



Uniform coal feeding in multiple retort underfeed stokers is now assured by a new agitating device incorporated in the latest type Taylor Stokers, according to the manufacturer. Bridging of coal in the stoker hopper, especially in the winter when the coal supply is wet or partially frozen, is eliminated by the Agitator's reciprocating motion across the stoker width between retorts. This also prevents bridging across the hopper lengthwise of the stoker, by breaking the support of the arch formed when coal flow is interrupted.

Power for the agitator is provided by the stoker's all-spur gear planetary transmission. A shearing pin provides protection against tramp iron or other obstructions in the coal. Oil-impregnated bushings need no lubrication. The Agitator, in contributing to uniform fuel bed conditions, is said to be an important factor in raising capacity of the generating unit with greater efficiency and less maintenance. American Engineering Co., Philadelphia 25, Pa.

An Improved Propeller Type Flow Meter

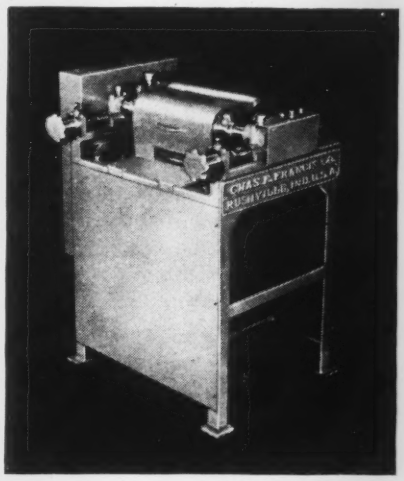


Builders-Providence, Inc., division of Builders Iron Foundry, long famous in the flow measurement field, has just announced a new propeller type flow meter for main line metering with many improvements, including streamline Venturi construction. This unit, called a Propeloflo Meter, has an 8-blade bakelite propeller moulded in one piece. Rotation is transmitted through spur and bevel gears. Shafts rotating in ball bearings assure maximum power to drive indicating and recording devices or proportioning chemical feeders. A Venturi throat evenly distributes the force of the flow against the full area of the propeller, resulting in improved accuracy throughout an exceptionally wide range of flow. Spiral flow is eliminated by straightening vanes just upstream of the propeller.

The propeller hub, bracket and nose are streamlined to reduce flow disturbance and divert fine grit, sand or scale away from the mechanism. Engineers will find the unit easy to service, it is said, owing to its "one-shot" lubrication system, the readily accessible stuffing box, and the ease with which the propeller mechanism may be removed from the line for inspection. A blank cover may be installed when the meter is removed. Wherever debris or heavy foreign material may be carried along the line with the moving fluid, Builders recommends and can furnish a section of pipe having a coarse screen and hand hole, to be inserted upstream from the meter. Builders Propeloflo Meter, Model PRF, is a precision-made instrument providing—at low price—wide range, accuracy and low pressure loss in the measurement of liquid flow in lines 6″ and larger. For further information write Builders-Providence, Inc., 9 Codding St., Providence 1, R. I.

Roller Coaters

Charles E. Francis Co., Rushville, Ind., announces a line of Coating Machines for coating any sheet material with any liquid or semi-liquid.

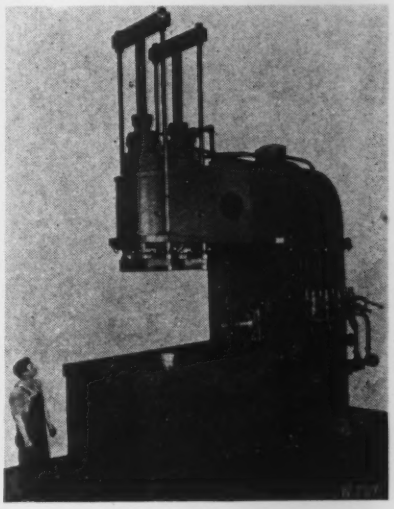


Although this particular machine was designed primarily for the wood working industry in connection with plywood, etc., it has a much broader use in view of the many coating processes that are now being used in connection with various types of material.

Similar machines are now being used for putting drawing compound on metal sheets or for putting photographic emulsions on metal sheets for a new photographic process of template work. Francis is building machines to meet special requirements. Bulletin on request.

Wood Sectional Flanging Press

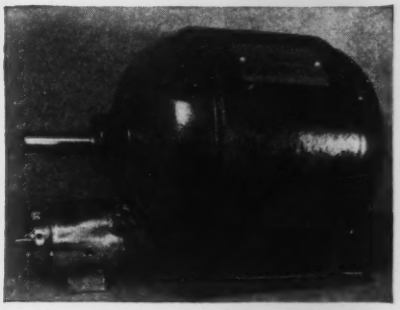
A hydraulic sectional flanging press designed for 1,500 lbs. per sq. inch working pressure has been recently completed by the R. D. Wood Co., Philadelphia 5, Pa.



Enclosed within the three piece heavy welded steel plate frame are two 10-inch tension columns which carry the full stress of the working load. There are two 16¾″ diameter vertical main rams; a 14″ stripper ram and a 15½″ double acting horizontal ram. The travel of the main rams is 30″ and each has a capacity of 150 tons. All operating valves are arranged in pulpit form. This arrangement will permit operating each of the two vertical main rams separately or both rams together, thus giving a total capacity of 300 tons.

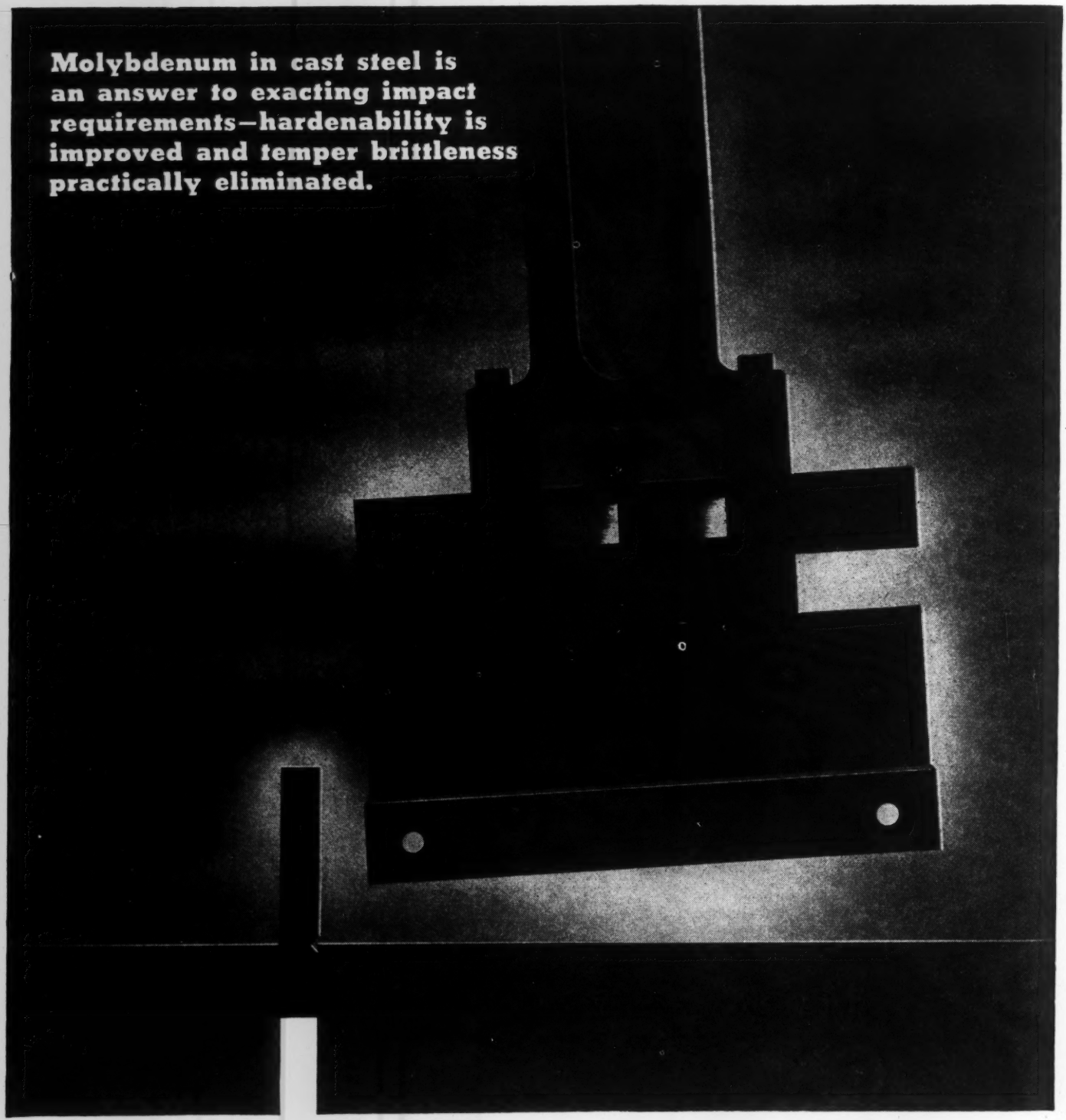
The stroke of both the horizontal ram and the stripper ram is 24 inches and the capacity 115 tons. Maximum daylight opening is 45 inches. Width of table, 8 feet. The table has four tee slots, machined from the solid, running from front to back and is machined for insertion of stripper cylinder.

New General Electric Motor Operates at 120,000 RPM



An electric motor operating at the record-breaking speed of 120,000 revolutions per minute, or more than seven million revolutions per hour, has been built and tested by General Electric. The motor was developed for application to internal grinding machines

Continued on Page 27



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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Climax Molybdenum Company

500 Fifth Avenue · New York City

MOLY

• Keep Informed

used in finish grinding small holes, many less than 1/4 inch in diameter, in vital war parts. Another possibility for its use is in driving small drill chucks for drilling tiny holes in soft metals, using drills 1/32 inch in diameter and less.

According to F. W. Baumann and D. H. Ware, G-E motor engineers, the surface speed required to produce a high-grade finish economically by grinding should be about the same whether grinding a large or a small hole. A medium size wheel rotating at a moderate speed gives the requisite surface speed but for small holes only a tiny grinding wheel can be used, hence the high rotating speed is essential.

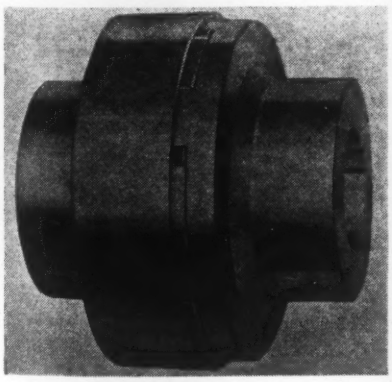
With normal voltage applied at 2000 cycles, the new motor reaches full speed in less than a second. It is rated 3 horsepower and weighs but seven pounds as contrasted with the standard 3-hp, 1800-rpm motor which weighs 105 pounds. The motor is so small that it fits into the palm of a person's hand, while its rotor is scarcely larger than a man's thumb.

Tests the motor has passed successfully at 120,000 rpm include eight-hour continuous runs at rated horsepower as well as grinding tests with a tiny grinding wheel mounted directly on the motor shaft.

Problems entering into the design of the motor were largely of a mechanical nature. Since the utmost in smooth operation is an essential to precision grinding, ultra-precision bearings with practically perfect dynamic balance were required. A special oil-mist lubricated type of bearing is used. The amount of material used in the motor is so small, with a consequent reduction in radiating surface, that water cooling is utilized, one-half a gallon a minute being used.

Important New Protection in Lovejoy Type "C" Coupling

Protection that secures operators against the catching of clothing, or incautious handling is embodied in the new L-R Type "C" shrouded flexible coupling announced by Lovejoy Flexible Coupling Co., 4957 West Lake St., Chicago 44, Illinois.



The essential feature of this new protection is the outside steel collar which holds the load cushions in place. An extension of this collar which encircles the coupling, safeguards material and fingers from the heads of the bolts that secure the load cushion retainer. The boltheads are concealed, yet easily and conveniently reached when necessity arises.

This improvement effects more compact design with overall smoothness of external surface.

L-R Flexible Couplings of the Type "C" class are designed for heavy duty services from 2.20 to 170 h.p. at 100 r.p.m. Indi-

Continued on Page 28

ABOVE—Milling machine vise, with inserts of Kennametal at points "A" and "B".

UPPER LEFT — Galled surfaces of steel jaw and screw.

LOWER LEFT—Kennametal inserts minimize wear.

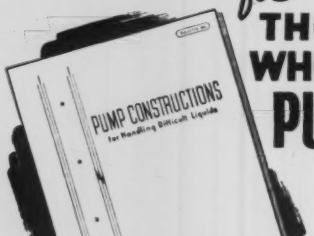
The superiority of Kennametal for wear-resistant purposes is graphicly demonstrated in this milling machine vise. The steel parts of the jaw and screw (enclosed in box "A") wore and tore under the twisting force exerted by the clamping mechanism. Thin discs of Kennametal—one brazed to the end of the screw, another recessed into the jaw at the abutting point—permit the jaw to be closed securely, and opened readily, with less effort. The performance of the vise has been further improved by inserts of Kennametal in the sliding surfaces on which the work rests, at points marked "B".

The high hardness of Kennametal (78 Rockwell C), and its unique non-galling property, provide resistance to abrasive wear that is up to 100 times that of steel. Kennametal's modulus of elasticity—2 to 3 times that of steel—minimizes possibility of deformation. Its unusual dimensional stability makes creep negligible.

Kennametal is available in a variety of standard shapes, or it can be furnished molded into almost any special form, limited only by reasonable proportions. We have supplied Kennametal . . . as accurately molded inserts for the customer to apply and grind as desired . . . mounted on parts furnished to us, and then finished by the customer or by us . . . embodied in elements or devices produced complete in our plant.

You can readily, and economically, incorporate Kennametal in the wear-areas of the machines you use, and the products you manufacture. Tell us your problem. We will suggest how Kennametal can solve it.

a New REFERENCE BOOK for THOSE WHO USE PUMPS

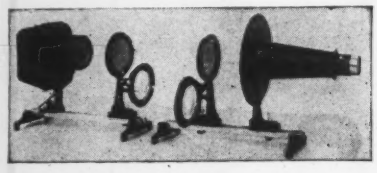


Contains authoritative data on recommended metals for the construction of pumps for handling difficult liquids.

FREE TO ENGINEERS

BLACKMER PUMP CO.
1920 Century Avenue, Grand Rapids 9, Mich.

Polaroid*... Photoelastic Polariscope for Stress Determination



To the machine designer, photoelastic stress analysis is not only of value in the verification of calculations based on theoretical solutions, but also in the solution of problems where theoretical analysis is not available. Where weight and space must be conserved actual stress distribution is more important than stress indicated by theoretical analysis.

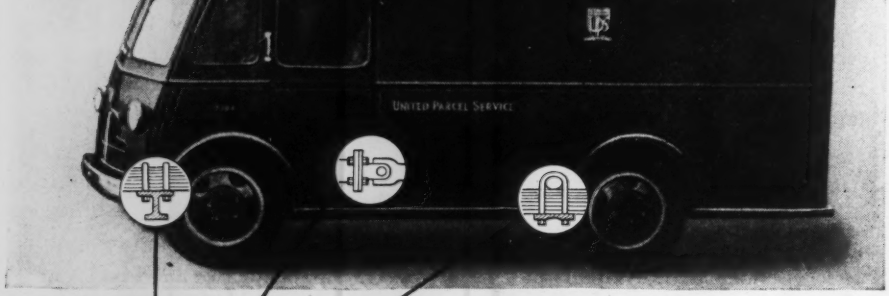
In the new model polariscope of 4 1/4" clear aperture, the parallel beam is collected by a rear element and condensed through a three component lens of the Cooke system. In the new larger unit (8 1/4" aperture) a four component lens of the Omnar system is used. *The image is sharp throughout the field, free of aberration, astigmatism and distortion.*

Literature of new model polariscope now available

POLARIZING INSTRUMENT CO., Inc.
1819 Broadway, New York 23, N. Y.

* *T. M. Reg. U. S. Pat. Off. by Polaroid Corporation*

The Boots Nut can be made standard equipment on even the *first* post-war models.



THESE NUTS TAKE A BRUTAL BEATING

. . . but, in a full year's test on U. P. S. trucks, not a Boots Nut had to be re-tightened!

AT the end of a 6 months' test on United Parcel Service Trucks not one Boots Nut had required attention! After a year, every Self-Locking Boots was *still* tight!

Because of its built-in, all-metal lock, the Boots Nut holds with a grip of steel! It never slips. It never deteriorates. It can be used again and again.

All Boots production today is reserved for military aircraft. But you can expect Self-Locking Boots on every kind of post-war motor vehicle.

Boots Aircraft Nut Corporation, General Offices, New Canaan, Conn.

BOOTS
SELF-LOCKING NUTS
"There's No Excuse for a Nut Shaking Loose"

• Keep Informed

vidual free-floating load cushions between the rugged jaws, are held in position between an inside steel sleeve, and the removable steel collar. Types are available for directly attaching to flywheel, also drum types and others for rapid disassembly without disturbing drive or driven equipment, etc. Cushions of various materials adapted to the particular service on which the coupling is used, are free to deform to every emergency—for correction of misalignment, protection from shock and vibration, and other transmission troubles which affect both drive and driven machinery. Smooth, noiseless, maximum power-flow is assured.

Cushions are always in sight. In operation half the cushions are idlers (except on reversing load). A new set of cushions is therefore always ready. No shutdowns for changing. No lubrication is required. The coupling is outstandingly noiseless.

Literature and engineering information is now available on the new L-R Type "C" couplings on request to the manufacturer.

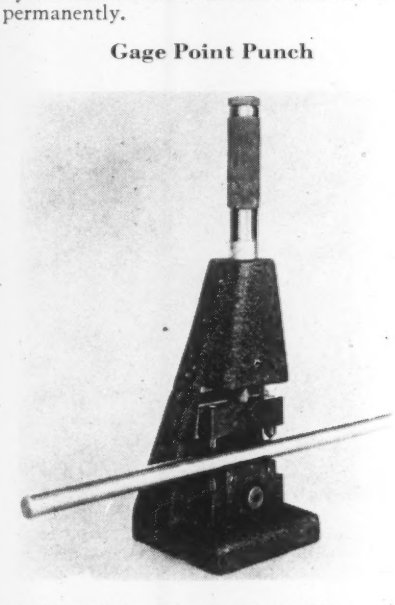
Torque Measuring Wrenches

The P. A. Sturtevant Co., of Addison, Illinois, announces a complete line of torque measuring wrenches comprising over 100 models which range in size and capacity from small instrument building wrenches of a few inch ounces capacity to great two handed torque wrenches of 7200 inch pound capacity.

These wrenches are being widely used for gauging, measuring and limiting applied tortional force, for equalizing the "set" of screws, nuts and threaded parts by tightening to a predetermined torque, and for measuring the frictional drag in motors and mechanisms.

They have become standard tools in leading production and inspection departments. All are of the flat tapered beam type with fixed end and top scales and are guaranteed by the manufacturer to retain their accuracy permanently.

Gage Point Punch



Philadelphia—The Baldwin Locomotive Works has just begun marketing of a gage point punch which is double-acting and on which impact force is adjustable for different materials. It is offered to the metals field for four reasons: (1) it marks four uniform centers on specimen with one push of the handle; (2) it automatically centers either round or flat specimens; (3) the impact force is applied manually by an adjustable detent which eliminates the use of a hammer; (4)

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impact and size of punch marks is adjustable to suit soft and hard specimens.

The upper punch holder, guided in a heavy frame, is attached to the impact-adjustable handle. The entire upper punch point assembly is spring supported to keep the gap between punch points open for largest specimen. When specimen is placed on support, the upper handle is pushed down until all punch points rest on specimen. A continued push downward on handle brings to a pre-adjusted compression a second spring within the tubular knurled handle, releasing potential energy to produce impact on specimen.

New Auxiliary Tempering Attachment for G-E Synchronous Spot-Welding Controls

A new tempering attachment, for use with G-E synchronous spot-welding controls which incorporate the phase-shift method of heat control, has been announced by the Industrial Control Division of the General Electric Co. The new auxiliary control is particularly suitable for use in the spot-welding of air-hardenable steels, since it permits tempering the weld while the work is still in the machine, thus reducing hardness and increasing ductility.

The attachment consists of a heat-control and a time-control adjuster for tempering, and the relays, which automatically transfer the additional heat-and-time adjustment from the spot-welding control, with which the attachment is being used.

The new attachment is enclosed in a metal case designed for wall mounting. The calibrated adjustment dials are mounted on the hinged door of this case, together with an On-Off switch for preventing the relays from being energized when ordinary spot or pulsation welding is being done.

Electronics Aids Production Again

Machining operations involving irregular surfaces, such as propellers, dies and cams, have in the past often required expensive and time-consuming hand labor—chipping, grinding, polishing. As might be expected, the final result was not always as exact as it might have been.

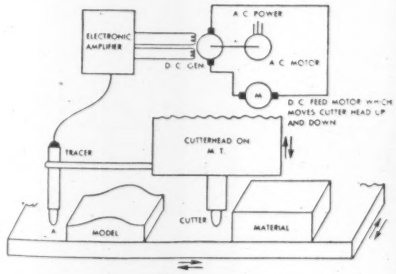

Fig. 1

A new tracer mechanism, with the Westinghouse Silverstat regulator as its operating medium has already been applied successfully to several such operations. In operation, a probe, mounted in connection with the Silverstat, is used to follow the contour of an accurate model—either actual size or to scale. As the probe is moved across the model, it affects the position of the Silverstat. Through an electronic amplifier, the cutting tool is moved correspond ngly with respect to the work.

The accuracy of the tracer mechanism is such that, with a well designed machine tool and an actual size model, the contour of the model can be duplicated within two or three thousandths of an inch when feed speed of twenty to thirty inches per minute is used.

Continued on Page 30

LUNKENHEIMER VALVES *Spell* "Low Maintenance"

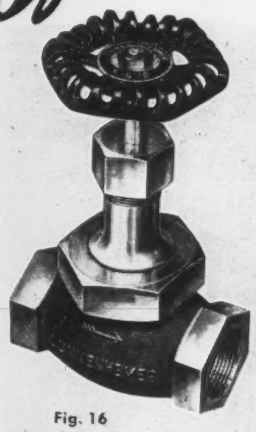

Fig. 16
"Renewo" Globe

Long service life and low maintenance have ever been the goal of Lunkenheimer design. Ask users why they prefer Lunkenheimer Valves and their answer is universal—"they're built to last and give the least amount of trouble."

These staying qualities are particularly important when production is running at previously unheard-of tempos — when "time out" is figured in loss of vitally needed equipment, rather than mere dollars. Lunkenheimer Valves are helping many a maintenance crew do a better job.

Illustrated are just a few of the many types of valves in the Lunkenheimer line —bronze, iron, steel and corrosion-resistant alloys—for all prevailing pressures and temperatures.

Your Lunkenheimer distributor is always ready to help you with your maintenance, repair and operating problems. His facilities are at your call.

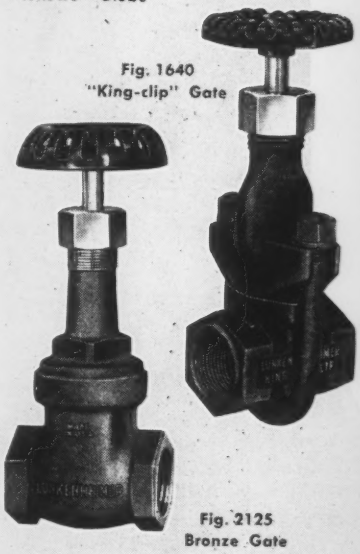

Fig. 1640
"King-clip" Gate

Fig. 2125
Bronze Gate

ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
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NEW YORK 13 CHICAGO 6
BOSTON 10 PHILADELPHIA 7
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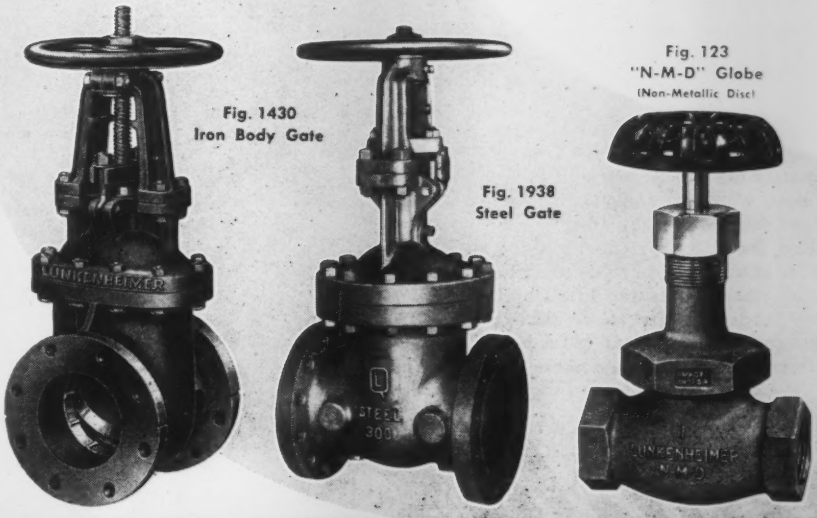


Fig. 1430
Iron Body Gate

Fig. 1938
Steel Gate

Fig. 123
"N-M-D" Globe
(Non-Metallic Disc)

BRONZE, IRON, STEEL AND CORROSION RESISTANT ALLOY VALVES, 125 TO 2500 LB. S.P.;
BOILER MOUNTINGS, LUBRICATING DEVICES, AIRCRAFT FITTINGS

Post-War Locomotives

Post-war locomotives of radically different design from the steam and Diesel power plants in use on railroads today were envisioned by James E. Davenport, Vice President, American Locomotive Co. in an address before the Western Railway Club.

In addition to greatly improved Diesel-electric and steam locomotives, Mr. Davenport predicted the development of locomotives powered by gas turbines.

Such engines, operating on the same principle as war-developed jet propulsion airplanes and superchargers for high altitude flight, are expected to burn low cost fuel, to operate at high efficiency and to produce a high horsepower output in proportion to weight, he said.

Steam locomotives, operating on the turbine principle, instead of with the conventional cylinders and side rods are another promising development, according to Mr. Davenport.

These ultra-modern versions of the Iron Horse, however, will have to prove their worth in comparison to greatly improved steam and Diesel locomotives, he asserted.

"The most significant development in motive power during the past ten years has been the rapid emergence of the Diesel locotive," Mr. Davenport pointed out, citing the fact that whereas ten years ago there were only 100 Diesel locomotives in use on American railroads, all of them switchers, "today there are over 4,000 Diesel locomotives on order or in service, 800 of which are road locomotives."

The Diesel locomotives which will haul tomorrow's freight and passenger trains, he continued, will be far more powerful units, weight for weight than today's streamliners, as a result of more efficient engines developed out of war-time experience.

At the same time, improved steam locomotives will continue to be the mainstay of railroad motive power, the speaker said. New designs promise increased power and efficiency, and an increased capacity to compete with the Diesel locomotive's chief advantage of being able to make long runs without refueling and with relatively little time out for servicing.

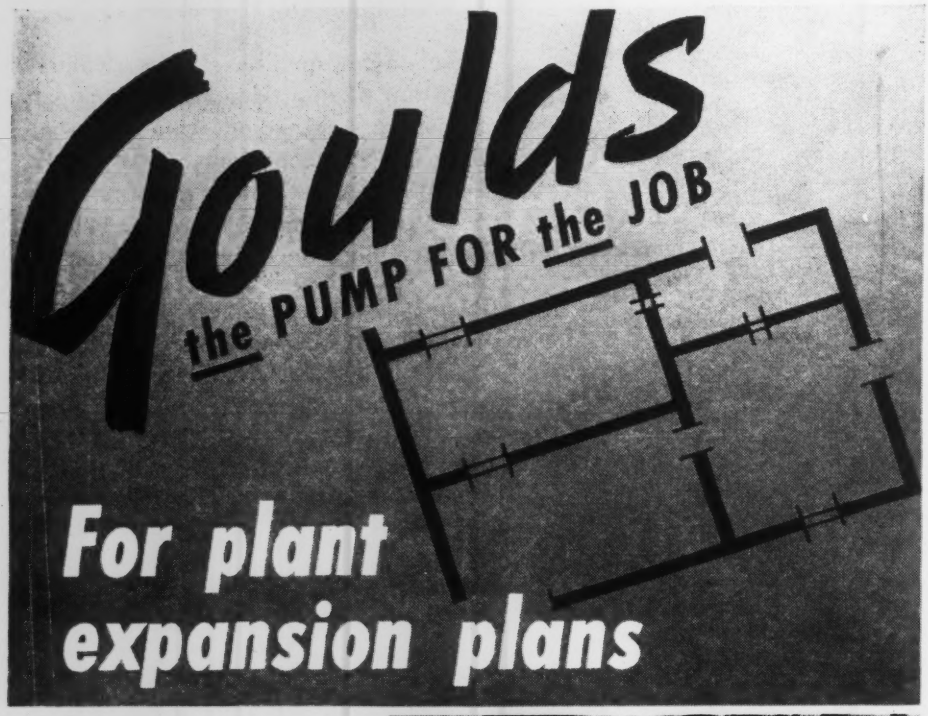
Turning from the future to present problems, Mr. Davenport emphasized that "in one sense tomorrow's locomotives are already here—locomotives of far greater efficiency than the bulk of the motive power on which our railroads are forced to rely in the present emergency. To the extent that these modern locomotives have found their way into service, they are producing outstanding performances". These are the locomotives, he said, on which railroads can rely to replace obsolete equipment in order to meet competition in the immediate post-war period.

Saving Money by Salvaging Zinc Die Castings

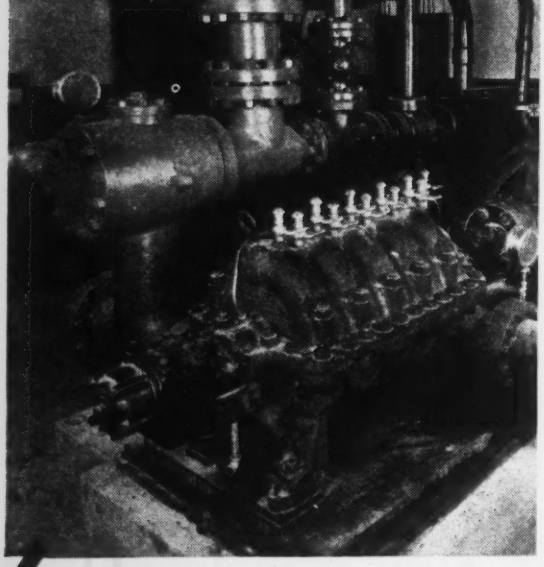
Zinc base die castings, which are normally difficult to repair, can now be easily and effectively reclaimed with the improved gas welding rod 195 that is now being marketed by the Eutectic Welding Alloys Co., the originators of "Eutectic Low Temperature" Welding.

The new rod 195 has a lower melting point and a still lower bonding temperature than the original alloy, which make it easier to apply without danger of damaging the parent metal. The improved rod is also easier to build up with, has greater tensile strength and matches the hardness of the die castings.

An excellent example of what can be accomplished with EutecRod 195 is shown in the picture above of a zinc base fuel pump die casting which had the whole top section broken off. Previous attempts to build up the part with ordinary rods had been futile, for at the point at which the alloy had to be applied there was a hole approximately $\frac{3}{8}$" to $\frac{1}{2}$" in diameter. This hole had to be bridged without the help of a backup material inside the assembly. To repair this part effectively, the regular technique recommended by the "Eutectic" Research Department was adopted.



Installation of Goulds Fig. 3330 Pump.



WHEN you are planning postwar plant expansion . . . it will pay you to bring your power plant pumping problems to Goulds . . . to specify Goulds pumps. 96 years of pump building experience enables Goulds to specify the pump that will do the job best, whether for boiler feeding hot and cold water circulating, sump, cooling tower or any other service. Now, of course, our pumps are going to our armed forces and to fill high priority orders . . . but we would like to talk over your postwar plans with you when the right time comes.

Goulds PUMPS INC.
SENECA FALLS, N. Y.

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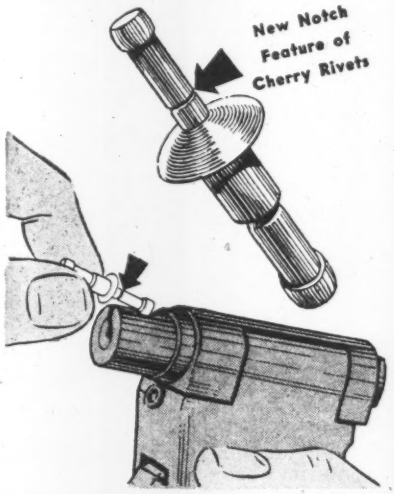
The break was "V'd" out to about a 90 deg. angle and the section to be welded was cleaned thoroughly. The entire coasting was preheated with an acetylene excess flame to about 700 deg. F., at which temperature EutecRod 195 bonds to zinc. Autochemic "Eutector" Flux 195 was sprinkled over the metal, and as soon as this melted, the rod was placed in front of the torch.

The lug was built up to its normal height in less than five minutes, and only one inch of a 1/4" thick rod was used. The manufacturer is now saving hundreds of these defective castings which had previously been discarded.

New Notch Feature Improves Blind Rivets

Cherry Blind Rivets are now being supplied with an important new feature, according to an announcement just made by the manufacturer. The addition of a notch in the pulling mandril of the self-plugging type Cherry Rivet provides several important advantages, as revealed by careful tests.



This notch serves to inhibit the flow of the metal in the upsetting process employed in forming the pulling head. As a result, Cherry Rivets are now more uniform.

Another important advantage is that a shorter mandril is required, thus effecting a saving in material as well as providing for a shorter drawbolt movement, making possible the use of the gun for longer grip lengths.

Cherry Blind Rivets are designed to speed up production by making it easier to handle riveting jobs in difficult places where there is access to only one side of the work. Cherry Rivets are headed-up by a hand gun (G-10) or power gun (G-15) operated from one side of the work only. No bucking bar is needed.

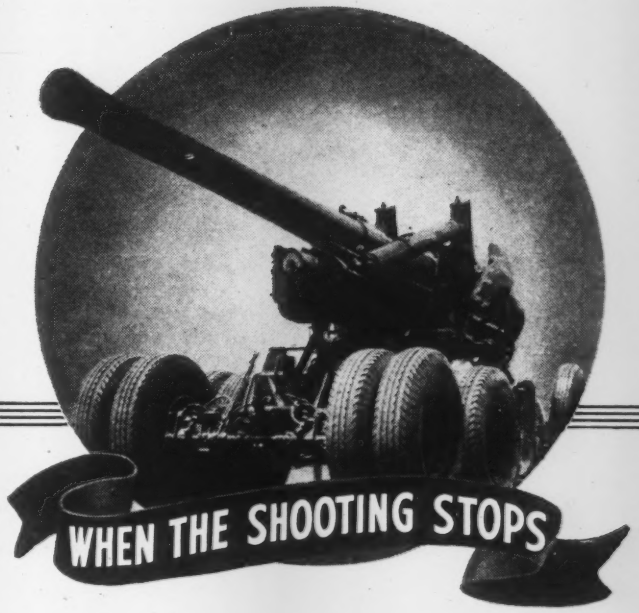
Standard drilling and dimpling tools are used to apply Cherry Rivets. The only tool required is the gun which is used to pull the mandril of the rivet with sufficient force to head the rivet on the blind side and break the stem at the notched portion. Both rivets and guns are manufactured by Cherry Rivet Co., Los Angeles 13, California.

New Blackmer Pump for Oil Sludge

A new 300 GPM pumping unit, powered by a 25 HP diesel engine has recently been produced by the Blackmer Pump Co., Grand Rapids, Michigan, according to information released by J. B. Trotman, General Sales Manager of the Company.

The new pump is designed for handling oil sludge and is fitted with steam jacketed heads to lower the viscosity of the pumpage.

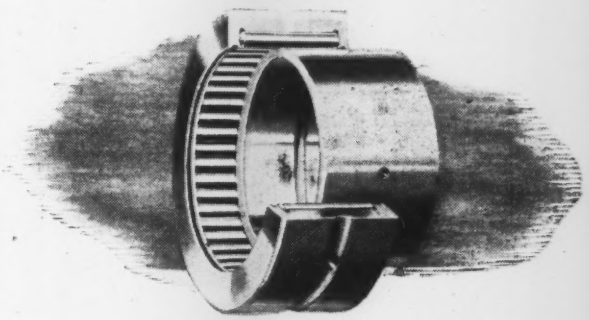
Continued on Page 32



When free men once more can plan and work in safety and peace, McGILL "Solidend" *MULTIROL* Bearings will play their part in rebuilding our civilian economy. Machine designers, engineers and mechanics have long recognized the superior advantages, and the greater load capacity McGILL "Solidend" *MULTIROL* Bearings offer.

Provision for incidental thrust, bearing rigidity, the elimination of end-washers and loose retaining rings, and numerous other points of superiority, make McGILL "Solidend" *MULTIROL* Bearings the choice of those looking for lower initial, operating and maintenance costs and improved performance. Our catalog SM-42 will be sent on your request.

McGILL Bearings are used in gun mounts.

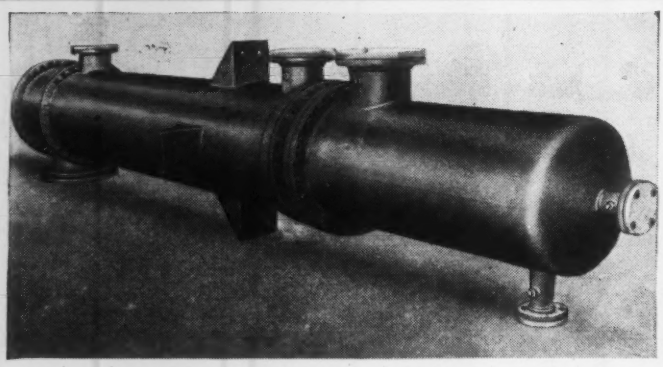


BEARING DIVISION

McGILL Manufacturing Co., Inc.

1100 N. Lafayette Street, VALPARAISO, INDIANA

When you think of Heat Exchangers...



"Organic Vapor Condenser with Separating Type Lower Head"

THINK OF DOWNINGTOWN

Recall the fact of Downingtown's specialized knowledge of design and fabrication . . . reflect upon Downingtown's ability to specify the correct materials . . . and to select the proper methods of procedure for handling them.

Wide experience in the manufacture of Heat Exchangers . . . complete, modern, plant facilities . . . assure you of good service and guarantee a safe and enduring finished job, delivering reliable performance over a long period of time.

Our engineering consultation is at your disposal.

Over 70% of Downingtown's 1942-43 Business was Repeat Orders

DOWNINGTOWN IRON WORKS
DOWNINGTOWN, PA.
HEAT EXCHANGERS

Put Wage Incentives to Work

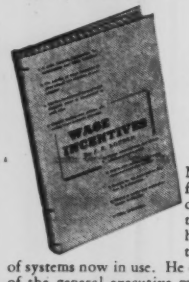
They more than pay their way, if you know what they are and what they can do for you. You need to know the theory, the basic principles, and the problems involved in tailoring these principles into suitable, successful incentive plans. The book to help you is:

WAGE INCENTIVES

by

J. K. Louden

Production Manager, Glass and Closure Division, Armstrong Cork Company



Mr. Louden discusses the fundamental bases and concepts for all types of incentive plans. Point by point, he takes up the elements of the five most common types of systems now in use. He delegates the responsibilities of the general executive manager, the industrial engineer, the foreman, and the union. You who have learned not to waste time and materials, may still be wasting employees. A well-organized and administered incentive system does away with this kind of waste and results in satisfied workers producing for you at maximum speed and efficiency. Let WAGE INCENTIVES demonstrate how.

174 Pages $2.50

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Please send me on ten days' approval a copy of Louden's WAGE INCENTIVES. At the end of that time, if I decide to keep the book, I will remit $2.50 plus postage; otherwise I will return the book postpaid.

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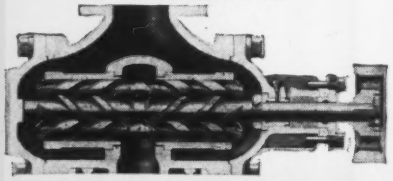
IMO OIL PUMPS

for BATTLE *Dependability*

A cruiser of the U. S. Navy, one of the classes of ships equipped with De Laval-IMO oil pumps

On fighting ships, where reliability and dependability under strain are all important and where space is at a premium, many thousand IMO oil pumps are in use pumping fuel oil, circulating lubricating oils, and operating hydraulic machinery. The simplicity of construction and operation that makes the IMO pump so dependable in battle assures the commercial user of long life and trouble-free operation. This unique pump has practically nothing to get out of order; it has only three moving parts, and no pilot gears or valves.

Write for Leaflet 1-117.



IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton 2, New Jersey

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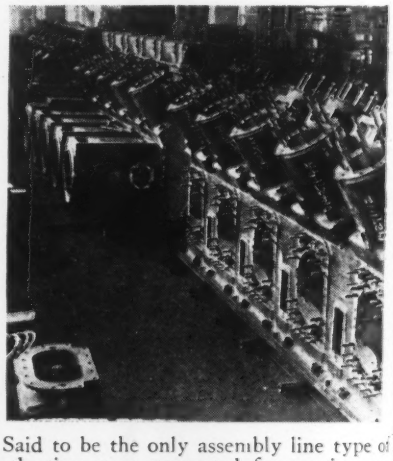
The engine speed is 1200 RPM, reducing through a double-reduction, oil immersed drive to 300 RPM on the pump shaft. The discharge pressure of the pump is 25 psi.

Currently these pumping units are being furnished to the U. S. Navy. Similar units, powered by diesel, conventional gasoline or steam engines, or electric motor have many industrial applications and will, according to Mr. Trotman, be a part of the Blackmer post-war line.

Line Assembly of 56-Ton Compressors Inaugurated by Cooper-Bessemer

Mount Vernon, O.—An outstanding production development which typifies the ability of American workmen to overcome unusual wartime conditions was disclosed by officials of The Cooper-Bessemer Corporation here who announced that the firm has set up a production line system designed to speed up and facilitate the assembly of huge 56-ton compressor units.



Said to be the only assembly line type of production ever attempted for turning out engines of this size, the idea was conceived and put into effect by Robert Humphreys, superintendent of engine erection and testing for the 111-year-old engine building firm, to meet industrial demands for additional compressor horsepower needed in the war effort.

Construction consisted of embedding steel tracks in the erecting floor and mounting steel skids on the engines bases so that the huge units can be rolled from station to station.

As compared to conventional methods of assembly, this arrangement permits locating various component parts of the company's type GM-V compressor at selected areas along the line, thus eliminating much of the work formerly done with overhead cranes and by hauling.

"With this method," said Humphreys, "we roll the engine to the parts instead of transporting the parts to the engine".

An idea of the efficiency effected with this novel idea is exemplified in a recent letter received by Cooper-Bessemer from Paul R. Taylor, director, Natural Gas Division, Office of War Utilities, War Production Board, which said in part, "Considering the severe handicap under which your shop had to labor as a consequence of delays in securing essential components from outside suppliers, it is felt here that a splendid accomplishment has been achieved.

"Those of your organization who made this possible may well feel that they have again contributed substantially to the war effort and to the alleviation of a severe gas shortage in the middle west.

"Will you please extend this thought to your people at the factory?"

• Keep Informed

Besides manufacturing gas and Diesel engine drive compressor units for gas pipeline transmission and for the production of critical synthesis products Cooper-Bessemer's plants at Mount Vernon, Ohio, and Grove City, Pa., are supplying thousands of Diesel horsepower for generating electricity and for powering vessels of the Allied navies.

Haynes Stellite Grooving and Cutoff Tools

Grooving and cutoff tools of Haynes Stellite cobalt-base alloy are made by Haynes Stellite Co., a Unit of Union Carbide and Carbon Corp. Haynes Stellite grooving tools are finish ground and lapped to specified tolerances. Haynes Stellite cutoff tools are ground to size but not lapped unless specified by purchaser. Both types of tools may be obtained in either 98M2 or Star J-Metal alloy—with Haynes Stellite 98M2 especially recommended for steel.

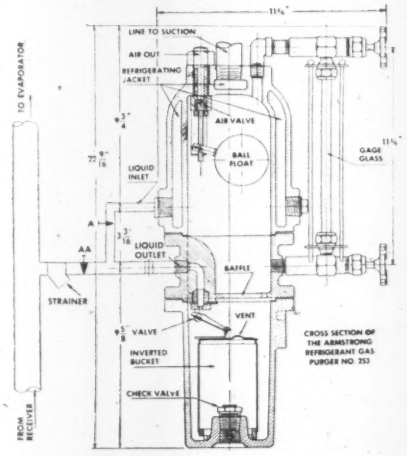
Grooving tools are furnished in three types—plain, channel, and I-beam—for grooving operations on cast iron, aluminum, brass, bronze, and steel. The side lands are lapped to give maximum tool life. To resharpen these tools it is necessary only to grind the cutting end, maintaining the front clearance angle.

Haynes Stellite cutoff tools are made in two styles, identified as Style 1 and Style 2. Both styles are of the double-bevel type, the tapered sides providing side cutting clearances. A 6 deg. angle is incorporated in the top and bottom edge of Style 2 to make it adaptable to certain cutoff tool holders. Both styles are suitable for cutoff operations on tubing, cylinders, or hollow forgings of cast iron, brass, bronze, aluminum, and some types of steel.

Further information on these grooving and cutoff tools may be obtained from Haynes Stellite Co., Kokomo, Indiana.

Improved Purger for Refrigerating Systems Having Suction Pressures Below Atmospheric

In order to overcome wear on valves and seats occasioned when purgers are subject to almost continual operation, such as occurs in refrigerating systems when the suction pressures are below atmospheric all or part of the time, causing infiltration of air, the Armstrong Machine Works has developed a new purger, Model No. 253.



As shown in the accompanying diagram, the valve controlled by the inverted bucket discharges liquid refrigerant to the liquid supply line instead of directly to the refrigerating jacket. Thus, instead of a pressure differential of anywhere from 100 lbs.

Continued on Page 34

Don't guess at Cutting Fluids

A cutting fluid is measured by its performance on a particular job. Yet it isn't necessary to try one oil after another until you hit the one which performs best. Engineering knowledge based upon experience can expedite your selection.

D. A. Stuart Oil Co. offer you the cooperation of skillful, trained engineers. Experience since 1865 has developed an insight into the fundamentals of cutting and grinding fluid application which is available to you with every drum of Stuart Oil.

There is a Stuart service engineer near you ready to help eliminate guessing at cutting fluids. Why not use him?

Having difficulties in thread grinding, gear grinding, form grinding? Investigate Stuart's grinding oils, including Thred Kut 99 grinding oil, SuperKool 81X, and Excelene.

Our new booklet, *"Grinding With Oil,"* tells the story. Write for a copy.

D. A. Stuart Oil Co.

LIMITED

2741 SOUTH TROY STREET, CHICAGO 23, ILL.

ESTABLISHED 1865

Warehouses in Principal Metal-Working Centers

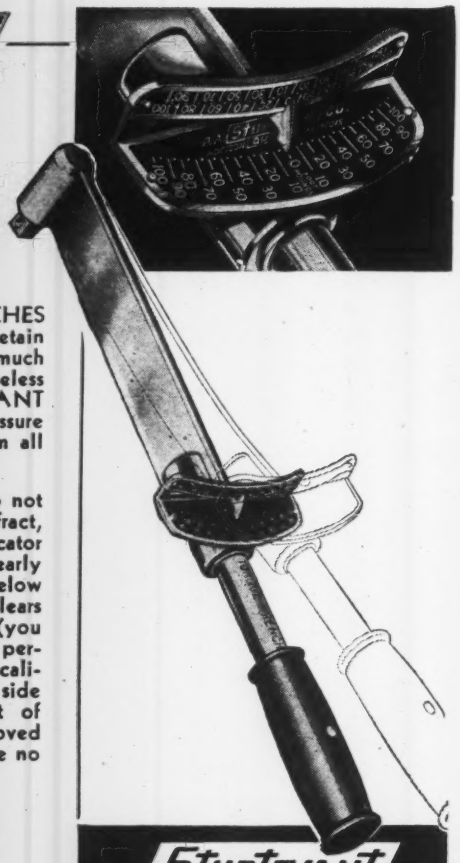
STURTEVANT QUALITY

Easy to Read Accurately from any Working Angle

STURTEVANT TORQUE WRENCHES are not only accurate when new, but retain this accuracy *permanently*. However, much of this inherent accuracy would be useless were it not that the dials on STURTEVANT Wrenches are so designed that they assure accurate readings at all times and from all working angles.

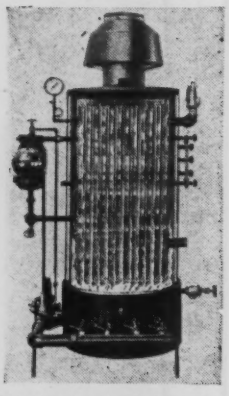
Dials on STURTEVANT Wrenches do not have glass faces to glare, reflect, refract, crack, check, stain or break. The indicator pointer holds its fixed position—the clearly marked calibrations passing *laterally* below it. The tip of the indicator pointer just clears each raised or sharply depressed mark (you cannot cross-read below it). It is flared perpendicularly to screen out adjacent calibrations and prevent mis-readings from side angles. Like the measuring element of STURTEVANT Wrenches, these improved dials permanently accurate, they require no periodic re-settings.

Write for Bulletin TW-17 Showing STURTEVANT Torque Wrenches in capacities from 0-40 inch ounces to 7200 inch pounds.



P. A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

More Horsepower . . . per Unit of Floor Space

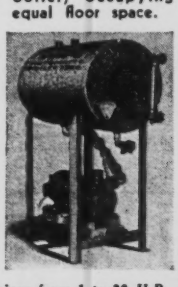


THE KANE gas-fired steam boiler has an asbestos lined, sheet steel jacket *around* (but *not against*) the boiler proper. The hot gases of combustion, directed by spiral baffles, pass spirally around the shell, as well as through the tubes. This use of the shell for additional heating surface, increases boiler efficiency, insures high quality of steam and delivers more horsepower per unit of floor area than produced by an ordinary vertical fire tube designed boiler, occupying equal floor space.

Patented *double diaphragm* gas control *automatically* regulates gas feed to maintain constant steam pressure.

MKayO Boiler Feed and Condensate Return System automatically returns hot condensate . . . adds needed make-up water to maintain proper level for most efficient boiler operation.

We are interested in your steam problems. Feel free to consult our Engineering department at any time—no obligation.



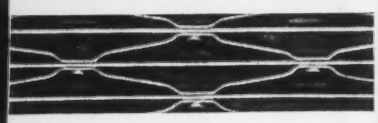
Built to ASME Specifications in sizes from 1 to 30 H.P.

MEARS-KANE-OFELDT
Manufacturers of Automatic Steam Boilers for over a third of a century.
1903-1915 EAST HAGERT STREET, PHILADELPHIA 25, PA.

IRVING GRATING

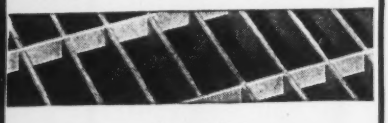
FLOORING AND STAIR TREADS

"A Fitting Grating for Every Purpose"



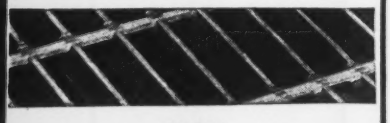
Riveted

Walkways — Stair Steps — Platforms
Trucking Aisles — Trench Covers



Press-Locked

Industrial Plants — Oil Refineries
Chemical Plants — Power Houses
Naval and Merchant Ships
Locomotive, Passenger and Freight Cars



Welded

Catalog for the asking.

IRVING SUBWAY GRATING CO., INC.
ESTABLISHED 1902
HOME OFFICE and PLANT: 5010 27th STREET
LONG ISLAND CITY 1, NEW YORK
WESTERN DIVISION: FOOT OF PARK AVE.
EMERYVILLE 8, CALIFORNIA

• Keep Informed

to 200 lbs. the pressure differential across the valve is only one or two lbs., which keeps wear on the valve and seat at an absolute minimum.

This new model does not replace previous models, but is especially recommended for systems with low suction pressures. It is also available in a forged steel model. Complete data is provided in a new bulletin No. 160, which discusses Armstrong purgers and purging in general. Armstrong Machine Works, Three Rivers, Michigan.

Carrier Unit Cools the Coolant at J. S. Thorn Co. Plant

"Putting the heat on" for 24-hour production of shells and cartridge containers developed very real meaning for J. S. Thorn Co., Philadelphia, peacetime makers of steel windows and sheet-metal products.

Cutting oil flowing on the hot metal being machined, cooled off fine between one eight-hour day and another. But when demand for munitions forced the machines to work around the clock, the oil never got a chance to cool. At the end of 24 hours, the oil was sizzling up around 190 degrees. Workers couldn't touch their machines or the products turned out by them in eight or ten automatic operations.

A method of "cooling the coolant" was obviously needed. The problem was overcome with the installation of a Carrier Evaporative Condenser as the key part of equipment now cooling 100 gallons of cutting oil per minute. This volume, since each machine receives three gallons of oil per minute, is 61 gallons more than the minimum required by the 13 Conomatic machines at the Thorn plant. The extra capacity gives a useful margin. The entire system contains about 2,000 gallons of cutting oil—110 gallons in each machine, 500 gallons in the main tank, and the remainder in pipe lines.

Due to vaporization and other losses, it is necessary to add 1700 gallons of oil to the system each month. Therefore, a total of 3,700 gallons of oil is cooled monthly.

After serving the machines, the oil drains to a reservoir. This reservoir acts as a separator. The clean oil spills over into a compartment from which it is pumped into coils in the Carrier Cooling Unit. Here water and air are circulated over the coils and become vapor. Heat causing this vaporization is taken from the cutting oil. Well cooled by the time it leaves the unit, the oil is once again an effective coolant and starts off on another round trip to the machines.

Centrifugal Refrigerating Machines Used in Making Rayon Tire Cords

With the greatly expanded use of rayon for cords and fabric in heavy-duty tires, centrifugal refrigerating machines have shouldered another vital war duty having great significance to the post-war automobile and airplane age.

Rayon tire cords, according to official reports, give superior wearing qualities to heavy-duty tires for trucks, buses and large planes. Even more important at this time the use of rayon cords reduces the amount of rubber required per tire. Critical supplies of natural and synthetic rubber are conserved. The weight of the tires is cut down making them easier to ship and handle,—enabling bombers to carry more bombs.

As part of the War Production Board's program to provide sufficient rayon for immediate military needs and for the nation's synthetic rubber tire program, the American Viscose Corp. is expanding its rayon manufacturing facilities at Front Royal, Virginia. Since refrigeration is essential to reconstituting cellulose in the form known as rayon,

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this expansion has resulted in the company's purchase of four additional Carrier centrifugal refrigeration machines to cool brine. The brine is circulated to the soda, mercerizing, churn mixing, and viscose aging departments. Regulation of temperature is vital in these departments to control chemical processes and produce a standard, high-grade rayon tire cord.

The new centrifugals have a combined cooling capacity of 1,500 tons when lowering the temperature of brine from 17°F. to 10°F. They are driven by steam turbines to the back pressure type.

Even before this most recent expansion of facilities, American Viscose possessed one of the largest batteries of Carrier Centrifugal Refrigerating machines in the country. This line-up is an index of the spectacular growth that rayon manufacture has experienced during the last two decades, for the machines are essential in the majority of the steps in rayon manufacture.

Many of the centrifugals installed by American Viscose when they were first produced by Carrier, are today giving efficient service to war work. The rayon that they help to produce is being used, not only in essential military tires, but also in bomb parachutes, cargo parachutes, self-sealing gasoline tanks, and other products in important daily use on the war fronts.

"E" Award to Aurora Pump Co.

Captain Robert Henderson, U.S.N., of the Office of the Chief of Naval Operations, Washington, D. C., tendered the Army-Navy "E" Award for quantity and quality of war production to the Aurora Pump Co. of Aurora, Illinois, at ceremonies held at the company plant recently.

Mr. Frank S. Main, President of the company, accepted the "E" Award. Lt. Colonel Royal H. Place, Executive Officer, District No. 3, 6th Service Command, Chicago, Illinois, presented token "E" emblems to the Aurora employees. Acceptance for the employees was expressed by Mr. Michael Haas.

The Aurora Pump Co., manufacturers of a comprehensive range of Aurora centrifugal pumps and Apco turbine-type pumps, have established a splendid record of accomplishment in supplying pumping equipment for virtually all branches of the service, chiefly for the Navy Department.

• BUSINESS CHANGES

Joins Eutectic Engineering Staff

Clinton E. Swift, M.E., University of Illinois, now assistant manager of the Engineering and Research Department of Eutectic Welding Alloys Co. Before joining Eutectic, Mr. Swift was the manager of the welding division of Ampco Metal, Inc.; prior to that he was a welding engineer for the C. F. Braun Co., of California. He also was on the engineering staffs of American Brass Co. and Westinghouse Electric and Manufacturing Co., East Pittsburgh.

The Eutectic Engineering and Research Department is headed by Mr. R. D. Wasserman, inventor of the "Low Temperature" process and alloys. "Clint" Swift will handle industrial welding problems where his experience renders him particularly valuable. Along with his other duties, Mr. Swift will also act as one of the three technical advisors for "The Eutectic Welder," the other two being Mr. Wasserman and Mr. Harry Kough, welding specialist.

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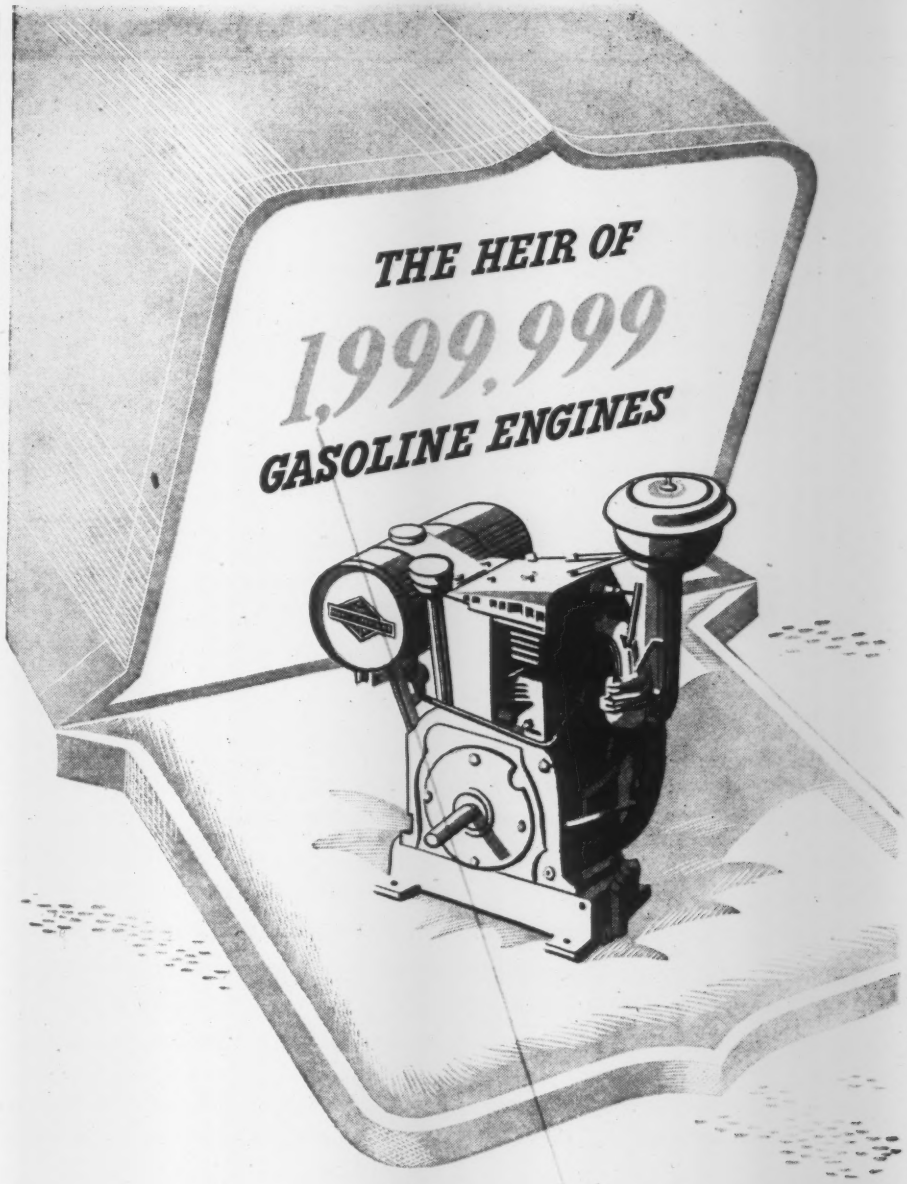


Recently the TWO MILLIONTH Briggs & Stratton engine moved off our production lines. We are now well started on the THIRD MILLION.

Air-Cooled Power

4 CYCLE BRIGGS & STRATTON GASOLINE ENGINES

We of Briggs & Stratton are proud of the endorsement of manufacturers, dealers and owners — and proud to be recognized as leaders in design, engineering and research, as well as precision production — the results of *twenty-five years* of continuous production of air-cooled gasoline engines.
BRIGGS & STRATTON CORP., MILWAUKEE 1, WISCONSIN, U. S. A.

Herndon Now Heads Link-Belt Coal Stoker Division

Link-Belt Co., Caldwell Plant, 2410 West 18th St., Chicago (8), announces that F. H. Herndon has been appointed manager of the company's Coal Stoker Division, in full charge of its activities and personnel, with headquarters at the Caldwell plant. Mr. Herndon has been asst. manager for the last 10 years.

It is also announced that K. C. Ellsworth, heretofore eastern stoker division manager at New York, has been appointed sales manager of the stoker division, with headquarters at the Caldwell plant, Chicago.

Mr. Herndon came to Link-Belt Co. from the Modern Coal Burner Co. in 1934, when Link-Belt acquired the automatic stoker business and stock of parts of this subsidiary of the Peabody Coal Co. He had started with the Peabody organization in 1918, later serving as a traveling auditor, and for two years having been general superintendent for Modern Coal Burner Co.

"Ken" Ellsworth has been through practically every phase of selling in the Link-Belt stoker division, joining it in 1934, after having been the company's stoker dealer in Erie, Pa.

Since then he has served in Chicago district retail sales; as district representative in the south; as district representative in the middle-western area, with headquarters in Chicago; as eastern division manager, with headquarters in Philadelphia; and lastly as eastern division manager with headquarters in New York City.

The Caldwell plant, where Link-Belt stokers are built, is headed by Mr. G. Walter Ostrand, general manager.

FRASER-BRACE ENGINEERING CO., Inc.

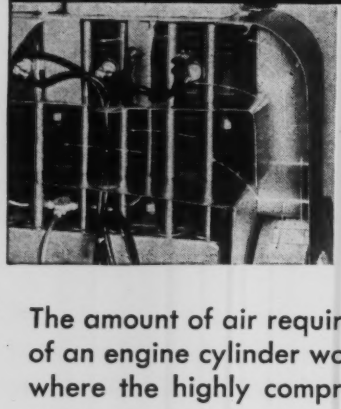
Design, construction and installation of complete plants and projects

Mechanical, Heavy Industries, Shipbuilding, Hydro-Electric Developments, Power Plants, Chemical and Refining Plants, Process Industries, Metallurgical Developments and Processes, Explosives, Plastics, Water Supply and Treatment, Sewage and Industrial Wastes Treatment.

• REPORTS • APPRAISALS • CONSULTING •

10 East 40th Street New York 16, N. Y.

AIR in Abundance . . .



but it's SCIENTIFICALLY "RATIONED" for WISCONSIN ENGINES

The amount of air required for cooling the lower half of an engine cylinder won't do for the "business end", where the highly compressed fuel charge explodes.

With a continuous, large-volume air-flow to draw from, Wisconsin engineers have long since figured out just how much air to *ration* to each section of the engine, for most efficient cooling.

This is important in relation to the satisfactory performance of *your* power-operated equipment.

Most H.P. per pound

WISCONSIN MOTOR Corporation

MILWAUKEE 14, WISCONSIN, U. S. A.

World's Largest Builders of Heavy-Duty Air-Cooled Engines

H. E. Strang to Vice President's Staff

Harold E. Strang, for the past three years engineer of General Electric's Philadelphia Works, has been named to the staff of H. A. Winne, vice president in charge of design engineering, Apparatus Department, it has been announced by the company. Mr. Strang, whose appointment became effective April 1, will be located in Schenectady.

A native of Mechanicville, N. Y., he was graduated in 1922 with a B.S. degree in electrical engineering at Rensselaer Polytechnic Institute, and that same year joined General Electric as a test engineer at the Schenectady Works. He became acquainted with switchgear through tests assigned to him, and shortly was placed in charge of switchboard tests.

Mr. Strang next became a member of the Switchboard Engineering Department, transferring to Philadelphia in 1929 as an application engineer. In 1932 he was promoted to managing engineer of the Large Power Circuit Breaker Division, and on October, 1940, was named engineer of the Philadelphia Works.

Superheater Changes in Management

The Superheater Co., Limited of Montreal announces the following changes in the Management, which became effective, June 1st, 1944.

F. A. Schaff was elected Chairman of the Board. He had previously served as Senior Vice-President from July 1920 to July 1940, and from then on as President. He is also President of the associate company, The Superheater Co. of New York.

C. A. Odell was elected President. Mr. Odell became associated with the Company on May 19th, 1919, as Assistant to the late Mr. Andrew Loudon, then Vice-President. He has served as Assistant Secretary and Assistant Treasurer, Manager and General Manager. Mr. Odell came to the Company from the Canadian Pacific Railway. After Mr. Loudon's death he was elected Vice-President on April 20th, 1926, which office he has held until his election as President.

H. E. Brown was elected Vice-President. Mr. Brown has been with the Company since June 1st, 1926, previous to which time he was with the Canadian National Railways. Mr. Brown has been Assistant to Mr. Odell; and General Manager since March 1934. He will now be in charge of the Company's Operations under the President.

G. S. Thomson was elected Vice-President. Mr. Thomson came with the Company in May 1916, and for the last twenty-four years has been Manager of the Works at Sherbrooke, Quebec.

Dr. Pennington Added to Carrier Research Staff

Carrier Corp., Syracuse, N. Y., manufacturers of air conditioning, refrigerating, and heating equipment, has announced the addition of Dr. William A. Pennington to the research staff of its Engineering Division which is headed by vice-president Herbert L. Laube.

Dr. Pennington will devote himself to Carrier's metallurgical and chemical problems, including a number of research projects connected with the company's preparation of new and redesigned products for the post-war period, the announcement said.

A native of Halls, Tenn., Dr. Pennington took his B.S. in chemistry at Union University, Jackson, Tenn., in 1925, subsequently becoming head of the mathematics department there. Iowa State College granted him a Ph.D. degree in chemistry in 1933, after

• Keep Informed

which he joined the research department of the American Rolling Mill Co. where he helped develop corrosion-resistant materials.

This research brought Dr. Pennington to the attention of the Mellon Institute, Pittsburgh, which offered him a fellowship to specialize in the field of physical chemistry as applied to metallurgy developments. Four years at the Institute were climaxed by his becoming associated with Carrier, where he took up his new duties March 1.

Dr. Pennington is a member of Sigma Xi, honorary research society; Alpha Chi Sigma, professional chemistry society; Pi Lambda Upsilon, honorary chemistry fraternity; the American Chemical Society, the American Society for Metals; the American Foundrymen's Association; and the American Association for the Advancement of Science.

H. C. Clarke Named District Manager of Bristol Co. Pittsburgh Branch Office

H. E. Beane, Sales Manager of The Bristol Co., Waterbury 91, Connecticut, announces the appointment of H. C. Clarke as District Manager of the Pittsburgh Branch Office. Mr. Clarke goes to his new position in Pittsburgh from Buffalo where he has been Bristol's Resident Sales Engineer for many years.

Mr. Clarke was graduated from Iowa State College, Ames, Iowa, in 1918 with a degree of B.Sc. in Chemical Engineering. After graduation he held positions as chemica engineer with Aetna Explosives Co., Empire Oil and Gas Co., The Illinois State Highway Commission, and Niagara Alkali Co.

In 1922 Mr. Clarke became associated with The Bristol Co. as sales engineer. Before becoming Resident Sales Engineer in Buffalo he was connected with The Bristol Co. New York, Pittsburgh, and Detroit offices.

Carbide Directors Named

At the annual meeting April 18th, stockholders of Union Carbide & Carbon Corp. elected Ralph R. Browning, Paul P. Huffard, and Homer A. Holt to the Board of Directors. Mr. Browning has been associated with units of Union Carbide & Carbon Corp. for 31 years, and Mr. Huffard for 35 years. Both have been vice-presidents of the Corporation since 1939. Mr. Holt is a Charleston, West Virginia, attorney and is the former Governor of the State.

Irving Subway Grating Co. Appoints Sales Representatives

New York—Anticipating a post-war boom in use of open steel grating as bridge decking, as landing mats for helicopters and for industrial flooring, the Irving Subway Grating Co., Long Island City, announces the appointment of five new district sales representatives and sales organizations in the mid-South.

They are: H. W. Stovall, Richmond, Va.; General Marine & Supply Co., Charleston, S. C.; Illingworth Engineering Co., Jacksonville, Fla.; Leo Magnus, Memphis, Tenn.; and Rittelmeyer & Co., Atlanta, Ga.

"Surveys have shown the new industrial South will be the first to capitalize on post-war needs and demands", Walter E. Irving, company president, said in announcing the appointments.

"We visualize particular demands for decking for bridges, grating for industrial flooring and landing mats for helicopters.

"Thousands of obsolete bridges on country roads throughout the country can be salvaged cheaply and made serviceable for years to come by using open mesh steel decking in place of their present concrete or other type solid floors.

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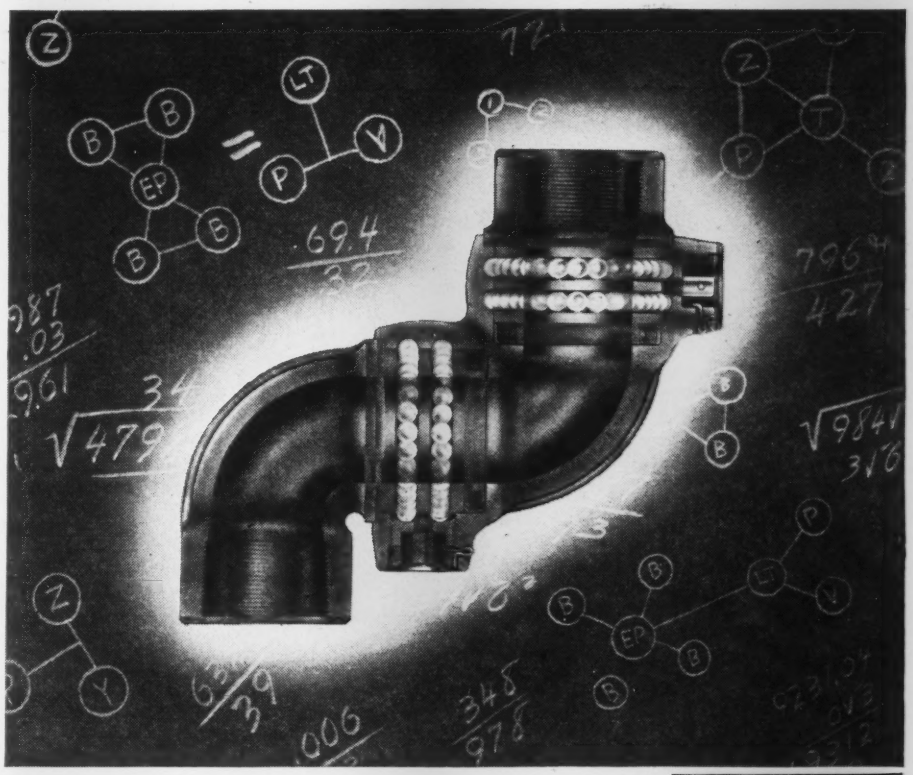
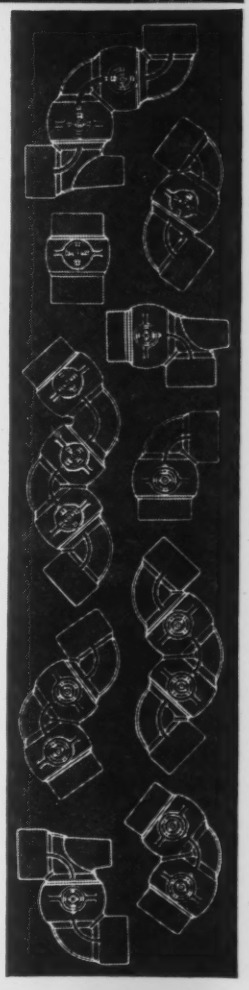


FORMULA for a *Perfect* SWIVEL JOINT

$$BB_2 + EP = \frac{LT}{P/V}$$

BB_2 = Double rows of Ball Bearings
EP = Effective Packing Element
P/V = Pressure or Vacuum
LT = Low Torque under all conditions.



CHIKSAN **Ball-Bearing** Swivel Joints are built to this formula . . . therefore, they **automatically** provide for swiveling or rotation with minimum torque under pressure or vacuum . . . at high and low temperatures. There is nothing to tighten or adjust. The same Joint can be used for both pressure or vacuum service because the Packing Element is self-adjusting.

With over 500 different Types, Styles and Sizes for every purpose, there is a CHIKSAN **Ball-Bearing** Swivel Joint to fit your needs. Write for latest Chiksan Catalog and Engineering data.

CHIKSAN REPRESENTATIVES IN PRINCIPAL CITIES
DISTRIBUTED NATIONALLY BY CRANE CO.

CHIKSAN TRADE MARK REG.

CHIKSAN TOOL COMPANY
Ball Bearing SWIVEL JOINTS for ALL PURPOSES
BREA, CALIFORNIA

"As for the post-war aviation age, we are now developing open steel mesh landing mats for helicopters, which may be used in one's back yard, atop urban buildings or over freight yards of terminals. We will need them to keep abreast post-war aviation needs.

"Floors of industrial plants have taken a terrific pounding during the war, and when peace comes many of them will need relaying for permanence. We have discovered the most economical rehabilitation is the use of continuity grating, filled with concrete, mastic or some other material depending upon the use of the floor. Although we specialize in many types of grating, we feel that these three uses will see a tremendous post-war boom."

Adams Now Chicago District Manager for American Engineering Co.

R. C. Adams has recently been appointed District Manager of the Chicago territory for the Stoker Division of American Engineering Company, Philadelphia. Mr. Adams is located at 11 South LaSalle Street, Chicago, Illinois.

Bristol Opens New Cleveland Branch Office Appoints G. H. Gaites Regional Sales Supervisor

H. E. Beane, Sales Manager of The Bristol Co., Waterbury 91, Connecticut, manufacturers of automatic control and recording instruments, announces the opening of a new Cleveland Branch Office. The new office, located in the Engineer's Building, Cleveland 14, Ohio, will serve the states of Kentucky and Ohio with the exception of the Toledo area.

Mr. Beane also announces the appointment of G. H. Gaites, Regional Sales Supervisor of the Cleveland and Pittsburgh territories.

Mr. Gaites studied Electrical Engineering at Brooklyn Polytechnic Institute. He was associated with the Brooklyn Edison Co. as Test Engineer in the Operating Department from 1912 to 1917. After serving two years as 2nd Lieutenant in the U. S. Army Coast Artillery, Mr. Gaites became associated with the Franklin Sugar Refining Co., Philadelphia, Pa., as Fire Prevention and Safety Engineer. In 1920 he joined the Bristol sales organization as Sales Engineer and was connected with the New York Office until 1927 when he was appointed Sectional Sales Engineer with headquarters in Cincinnati. In 1928 he was made district manager of the Bristol Philadelphia Office and in 1935 was named managing director of Bristol's Instrument Co., Ltd., London, England.

Two years later Mr. Gaites returned to this country to become district manager of the Bristol Pittsburgh Office.

Mr. Gaites will make his headquarters at the company's new Cleveland Branch Office, Engineer's Building, Cleveland 14, Ohio.

Carey Names Production Head

The Philip Carey Mfg. Co., Cincinnati, Ohio, has announced the appointment of C. B. Pooler as Vice President in Charge of Manufacturing. The Carey Company operates nine plants in the United States and Canada.

Born in Fort Dodge, Iowa, Mr. Pooler has spent practically all of his life in the Building Material Industry. An Electrical and Mechanical Engineer, he has served as Production Manager, Plant Manager, Division Operations Manager, Manager of Labor Relations in plants producing fabricated steel, metal lath, insulating board, roofing, paints, paper, asbestos and gypsum products.

Wickwire Spencer Buys Sirian Wire and Contact Company

The Wickwire Spencer Steel Co. recently announced the purchase of the business and assets of the Sirian Wire and Contact Co. of Newark, N. J. The steel company will immediately assume full control of all management and production operations of Sirian.

The Sirian Wire and Contact Co. manufactures a substantial percentage of all the fine drawn tungsten and molybdenum wire and rods, used in the radio, electronic, electrical instrument and lamp industries. In addition, various dies and tools of tungsten carbide are manufactured. All products of the company are vitally essential to the war effort and currently the complete output is for the government.

The purchase of Sirian is in line with Wickwire Spencer's policy of expansion to include operations for greater post-war markets and developments.

In connection with the new property, Wickwire Spencer announced the formation of a new subsidiary company, the Wickwire Spencer Metallurgical Corp. The subsidiary's former name, Sirian Wire and Contact Co., will be dropped.

Officers of the Wickwire Spencer Metallurgical Corp. are as follows: President, E. P. Holder; Executive Vice President Lt. Col. Cecil P. Young, Retired; Treasurer, George H. Creveling; Secretary, Franklin Berwin.

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Operations of the Wickwire Spencer Metallurgical Corp. will be under the direction of Col. Young, well known in the aeronautical field. Recalled to active duty with the U. S. A. A. F. immediately after Pearl Harbor Col. Young was appointed Executive Officer of the New York Air Defense Wing and was in charge of the development of Air Defense and the training of combat pilots in this area. In December 1943, he returned to inactive status and since then has been Executive Vice President of the Wickwire Spencer Aviation Corp., a subsidiary of Wickwire Spencer Steel Co.

Mr. L. D. Granger, prominent steel metallurgist and engineer, will also be connected with the Wickwire Spencer Metallurgical Corp. Mr. Granger is a Vice President of and has long been associated with the American Wire Fabrics Corp. another Wickwire Spencer subsidiary.

Offices of the Wickwire Spencer Metallurgical Corp. will be located at the company's plant, 260 Sherman Avenue, Newark 5, N. J.

Wickwire Spencer Steel Promotes McCarthy and Gordon

R. T. Dunlap, Vice President in Charge of Production of the Wickwire Spencer Steel Co., has announced the promotion of B. L. McCarthy to the position of Assistant General Superintendent of the Buffalo Plant. Also announced was the appointment of C. A. Gordon to the position of Superintendent of Hot Departments at the Buffalo Plant.

Mr. McCarthy was previously Chief Metallurgist of Wickwire Spencer and is well known in the industry as a chemist and for outstanding contributions to the study of steel metallurgy.

Mr. Gordon has a long record in the steel industry for operating efficiency for open hearth and hot mill management.

Both Mr. McCarthy and Mr. Gordon will be located at the Company's Buffalo Plant, River Road, Buffalo, New York.

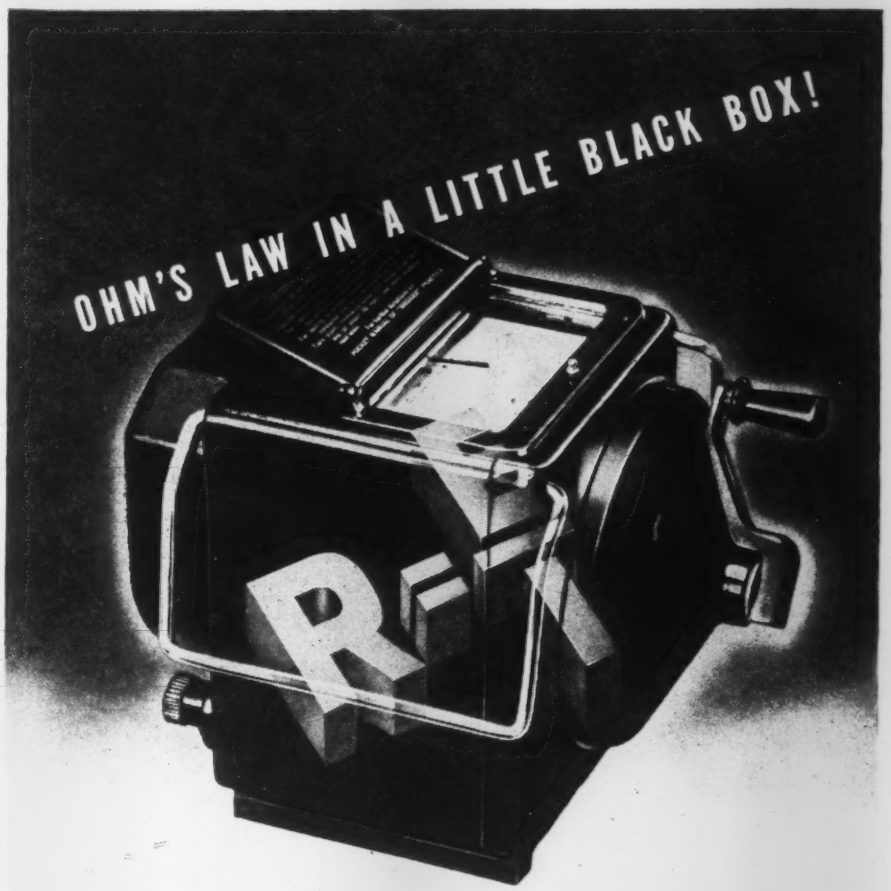
Metals Specialist Joins Cooper-Bessemer

The appointment of William F. Lamoreaux to the position of Research Metallurgist has just been announced by The Cooper-Bessemer Corp., 111-year old producer of Diesels, gas engines and heavy machinery. The firm also conducts an extensive foundry jobbing business, specializing in difficult or intricate high-duty iron castings up to 80,000 pounds in weight. Both of Cooper-Bessemer's manufacturing works, at Mount Vernon, Ohio, and Grove City, Pa., include a large Meehanite foundry complete with closely integrated production, engineering and research facilities.

Lamoreaux, who for the past three years was Director of Research for the Meehanite Metal Corp., will divide his time between the company's two plants. At the outset, he will undertake an even closer integration of the company's engineering, metallurgical and foundry efforts which have already produced many notable developments in foundry technique.

For example, Cooper-Bessemer has recently attracted nation-wide attention by producing highly successful cast Meehanite crankshafts of a size heretofore necessitating forged steel construction. The company has also received recognition for notable advancements in the difficult art of insert molding. Besides conserving war critical materials, these and other Cooper-Bessemer developments are believed to have extremely important post-war significance.

Continued on page 40



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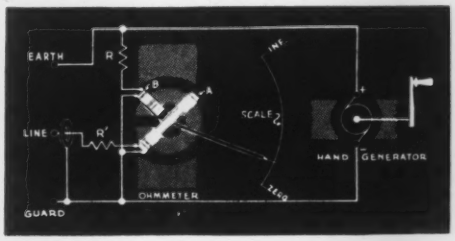

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Supplying basic design theory, construction and application in use today—this long-awaited book is a modern work in English on centrifugal compressors and blowers—written from the *American* viewpoint. It presents essential time-tested material and methods that explain standard practice—plus basic information needed to understand and apply new theories as they develop.

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In addition to his research work, Lamoreaux will specialize in exploring the application of high-duty iron castings to various phases of industry, particularly in the mining and heavy chemical fields, where it appears likely that advanced foundry technique and metallurgical progress will afford new, worthwhile advantages in the use of high-duty iron castings for a variety of services.

William F. Lamoreaux's background suits him ideally for these important responsibilities with Cooper-Bessemer. Prior to his connection with the Meehanite Metal Corp., he enjoyed considerable success for the five preceding years as a consulting chemical and metallurgical engineer following his position, from 1923 to 1936, as Vice President and General Manager of the Ducktown Chemical and Iron Co., Copperhill, Tenn.

Lamoreaux is a graduate of the Michigan College of Mines, Houghton, Michigan. He is now residing at Mount Vernon, Ohio, where the Cooper-Bessemer headquarters are located.

Reid Appointed Production Manager of Timken Roller Bearing Co.

James F. Reid, former Deputy Chief of the Alloy Steel Branch of the War Production Board, has been appointed Production Manager of The Timken Roller Bearing Co. of Canton, Ohio. Reid had been Production Manager of the Steel and Tube Division of the Timken Co. before obtaining a leave of absence in May, 1942 to join WPB as chief of the Alloy Steel Section. His activities and responsibilities in this new capacity extend to all divisions of the company.

James Reid first joined the Timken Co. twenty-five years ago as an employee in the production department, becoming, ten years later, Production Manager of the Steel and Tube Division.

Born in Motherwell, Scotland, he was made a U. S. citizen upon his honorable discharge from the American Army at the end of the first World War. With his wife, Mary Jane (Dozer) Reid and his son Alexander, 15, he lives at 1726 Woodland Avenue, Canton, Ohio. A daughter, Mrs. M. B. Mittleman, 24; and another son, James, Jr., 22, a senior at Ohio University, complete the family.

• LATEST CATALOGS

Cochrane Continuous Blow-Off Systems

The Cochrane Corp., 17th and Allegheny Ave., Philadelphia, Pa., has released bulletin 4081 descriptive of Continuous Blow-Off Systems illustrates the application of this heat-saving device that should be a part of every boiler room auxiliary equipment.

The bulletin explains the heat saving that can be accomplished, the advantages from the standpoint of regulating boiler concentrations, the type of equipment available for different heat balance requirements, as well as illustrations and photographs of installations, heat exchangers, etc.

This bulletin should be of interest to all steam users, particularly plants not already equipped with devices of this character. The bulletin is free for the asking.

Degasification of Water

Cochrane Corp., 17th and Allegheny Ave., Philadelphia 22, Pa., announces Bulletin 4076 "Degasification of Water" illustrates a number of equipments that are available for removal of gases from water at various temperatures. The bulletin illustrates means provided for removal of oxygen and carbon dioxide from water without the use of steam, the removal of small quantities of ammonia, the removal of hydrogen sulphide and carbon dioxide simultaneously, as well as illustrating different designs of Cochrane deaerators

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RATE Annuoncements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

• Keep Informed

available for elimination of gases in connection with boiler plants.

This bulletin should be of interest to those industries in which removal of gases from either cold or hot water is important A copy will be sent upon request.

Accessories and Supplies for Refrigerating and Air Conditioning Plants

York Corp., York, Pa., has just issued a new catalog of accessories and supplies for refrigeration and air conditioning plants.

The book is designed to give quick, complete "finger-tip" information under the following headings: accessories and supplies, ice cans and air fittings, valves and fittings, oil, cold storage doors, renewal parts, tables and data. Under the latter, sizes, weights, performance data, net prices, photographs, mechanical drawings, descriptions, and so forth, have been included. The catalog is the loose leaf type, divided into sections and tabbed for ready reference. It is available on request via business letterhead.

Steam Turbines

Terry Steam Turbine Co., Hartford, Conn., recently issued Bulletin S-140, which illustrates and describes their line of Single-stage and Multi-stage Steam Turbines for all applications and operating conditions from 5 H.P. to 2000 H.P. Used to drive pumps, fans, exciters, generators, compressors, paper machines, coal pulverizers, line shafting, etc.

"Barnesdril" Standard Hydraulic Units

Barnes Drill Co., 814–30 Chestnut Street, Rockford, Ill., announces this new Bulletin No. 150 covering "Barnesdril" Standard Hydraulic Units which are arranged Vertically, Angularly or Horizontally for special Drilling, Reaming, Facing, Boring or Tapping Operations. These "Standard Units" can be furnished as a complete machine for either drilling, reaming, boring, facing or tapping operations arranged in any way required for the most efficient handling of the work. They may be used in any one or combinations of vertical, angular or horizontal positions and are ideally suitable for grouping around indexing table for progressive operation.

Limiting the Temperature of Open-Hearth Roofs

Anyone who aims at top production from open-hearth furnaces, by running them at the top safe temperature, without endangering the roof, should be interested in a completely revised bulletin, "Limiting the Temperature of Open-Hearth Roofs", just issued by Leeds & Northrup Co. to show how O-H men may have all the benefits of the well-known Micromax Electric Control, applied now to roof temperature.

This system—actuated by a Rayotube detector sighting directly on the furnace roof—automatically maintains desired temperature by continuously regulating fuel input. The Rayotube detector is being applied to the front wall of tilting-hearth furnaces . . . to the rear wall of stationary furnaces. Schematic diagrams show typical applications of the equipment; numerous photographs illustrate actual installations.

Described and illustrated is the Model S Micromax Controller equipped for this application with two pens, providing users with an unusually detailed record not only of the operating temperature, but of the control setting as well. Also shown is the Model R Micromax Controller which for this applica-

Continued on page 42

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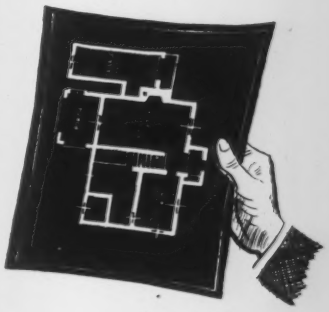

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tion has two large pointers—one to indicate actual roof temperature and the other the control point. The operator has only to glance at the two pointers to see any momentary difference between the desired and actual temperature.

The system is said to be easy to operate, is built for rough service, requires little maintenance and is easy to install. For more complete information, write for Bulletin N-33B-643(1), "Limiting the Temperature of Open-Hearth Roofs", Leeds & Northrup Co., 4934 Stenton Avenue, Philadelphia 44, Pa.

Welding Fitting Dimensions

To meet requests for a book covering welding fitting dimensions specified in Naval and maritime shipbuilding, Tube Turns, Louisville, Kentucky, announces its new maritime fittings catalog No. 112. Section 1 of this 48-page plastic-bound book contains dimensional data on seamless wrought steel and wrought iron fittings. Section 2 gives similar coverage to wrought carbon molybdenum alloy steel. Each section is fully indexed and is complete with cross section illustrations of each fitting.

Fundamentals of Electronic Control for Resistance Welding Covered in New General Electric Booklet

An attractive 46-page booklet (GET-1170) consisting for the most part of published articles by General Electric engineers on the circuits and operation of electronic controls for resistance welding, has been published by the General Electric Co. In the booklet, simplified circuit diagrams are used liberally in explaining the fundamentals of the many types of G-E electronic controls available to meet the exacting requirements of individual resistance welding processes and jobs.

Titles of the six articles reproduced in the booklet are: Electronic Welding Control; Seam and Pulsation Welding Controls; Special Welding Controls; Timers for Welding Control; Energy Storage Welding Controls; and Servicing Resistance Welding Controls.

A pictorial presentation of all types of G-E electronic controls for resistance welding follows the article. Also portrayed are the many electric accessories G. E. has available for resistance welding processes, including the electrode pressure gage, the magnetic oscilloscope, cable, capacitors, motors, air circuit breakers and the pointer-stop ammeter

New G-E Instrument Publication

A new General Electric publication, "Electric Instruments, Principles of Operation," presents a concise discussion of the characteristics of instruments, what makes them operate, and the individual limitations of the various types. Designated GET-1173, it is available on request to the Company at Schenectady.

The introduction to the publication points out that the use of electricity in manufacturing processes has become so general that the important question of whether it is being used in the most economical way is sometimes overlooked. Electric instruments are defined simply as the tools for obtaining essential information about electric circuits. Thus, a study of their construction and application invariably points the way to lower costs and improved manufacturing methods, according to the publication.

COMING MEETINGS AND EXPOSITIONS

During the next three months

AUG. - SEPTEMBER

29–Sept. 1	American Institute of Electrical Engineers, Pacific Coast Technical Meeting, Los Angeles, Calif

OCTOBER

2–4	The American Society of Mechanical Engineers, Fall Meeting, Hotel Netherland Plaza, Cincinnati, Ohio
5–6	American Institute Mining and Metallurgical Engineers, Iron and Steel Division, Second Annual Conference Electric Furnace Steel Committee, William Penn Hotel, Pittsburgh, Pa.
12–14	American Society of Tool Engineers, Syracuse, N. Y.
16–18	American Institute of Mining and Metallurgical Engineers, Institute of Metals and Iron and Steel Division, Cleveland, O.
16–19	American Welding Society, Annual Meeting, Hotel Cleveland, Cleveland, Ohio
16–20	American Society for Metals, National Metal Congress and War Conference Displays, Statler Hotel, Cleveland, O.
30–31	Joint Meeting A.S.M.E. Fuels and A.I.M.E. Coal Divisions, Charleston, W. Va.

For Calendar of coming A.S.M.E. Meetings see page 562 in the editorial section.

Built to "Take It"

THE new Model 10VA will subject parts or assemblies 10 lbs. in weight to a "shakedown" test that simulates the vibration conditions actually encountered in service. Tested for 50% overload. Vertical table movement. Features include:

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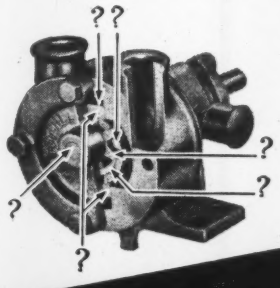

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- *BUSINESS CHANGES*
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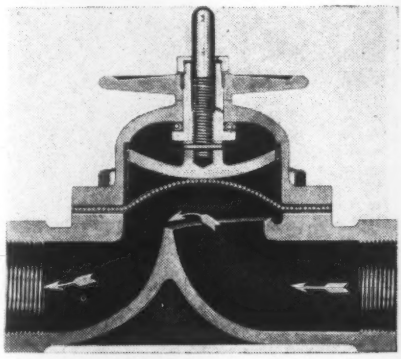
Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

New Diaphragm Valve

A new Diaphragm Valve (No. 1455) has been developed by the McAlear Mfg. Co., 1937 South Western Ave., Chicago 8, Ill., which represents a unique new development of wide application in industry; a most practical and economical valve for hard-to-handle fluids. Especially suited for acids and caustic fluids.

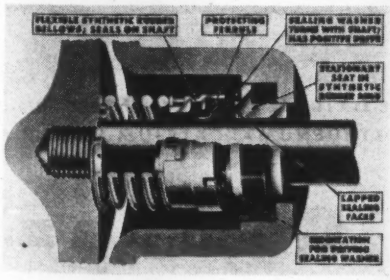


In many instances this valve will efficiently replace more expensive valves at a substantial saving in both initial cost and maintenance. It requires no repacking, no reseating, has no stuffing box, and all moving parts are fully protected from fluids handled. Solid matter trapped on seat does not prevent tight closing of valve.

A bulletin is available which gives service data, specifications, and tells about special applications.

John Crane Bellows-Type Shaft Seal

This new mechanical seal eliminates stuffing box leakage and provides perfect sealing on centrifugal pumps, refrigeration compressors, speed reducers, rotary pumps, agitator shafts and many other rotary sealing applications. It has already been thoroughly field-tested on many exacting services and is giving trouble-free performance at both high speeds and high pressures.



The "John Crane" Shaft Seal is furnished as a complete sealing unit, ready for use, and is simple and easy to install. Basically, it consists of three major parts: (1) a flexible synthetic rubber bellows, the tail end of which grips and seals along the shaft; (2) a stationary floating seat, held in a synthetic rubber sealing ring; and (3) a positively-driven sealing washer, which turns with the shaft and is held against the stationary seat by spring pressure. The contacting faces of the washer and seat are lapped to form a leak-proof seal.

An exclusive feature is the flexing head of the bellows, which offers no resistance to the spring. This design allows the sealing washer to remain in contact with the seat as the sealing faces wear, and provides automatic compensation for shaft vibration and end-play. A protecting ferrule, fitting the shaft loosely, guides the flexing bellows head and prevents the synthetic rubber from contacting the shaft. Note that there is no compression packing to freeze to the shaft and cause trouble.

The stationary floating seat used in most installations is held in a synthetic rubber holding ring as illustrated. This construction permits easy insertion, prevents stress distortion of the sealing face during installation and allows the face to be lapped before insertion, thus eliminating the difficulties involved in lapping the face in the seal cavity.

The flexible bellows and holding ring are molded of special high-grade synthetic rubber stocks for maximum resistance to oil, hydrocarbons, refrigerants, water and anti-freeze solutions. The other parts are made of materials best suited to give maximum service and to resist the chemical action of the fluids handled.

This high-precision mechanical seal is manufactured by Crane Packing Co., 1814 Cuyler Ave., Chicago 13, Ill. An illustrated bulletin giving full details is available on request.

Two New Outdoor A-C Welders Announced by General Electric

Two new outdoor alternating-current welders, a 500-amp type and a 300-amp type, have been announced by the Electric Welding Division of the General Electric Co. The 500-amp welder has a current range from 100 to 625 amps, while the range of the 300-amp welder is from 60 to 375 amps. Both of the new welders are specifically designed for use in shipyards and similar outdoor locations where exposure to the weather is common.

These welders are equipped with an "idle-matic" control which functions to reduce the output voltage automatically to less than 30 volts whenever the arc is not in operation, yet provides full power for welding directly the arc is struck. In addition, this control is provided with a switch, conveniently operated by a handle projecting through the top of the case, for shutting off the welder when not in use.

Protection against the entrance of rain, snow, and sleet is provided by the dripproof construction of all openings in the top of the sturdy enclosures of the welders, and by a sealed window over the current indicator. The ventilating openings serve both to shed water and to keep air velocity low. A special finish on all internal parts provides protection against corrosion from moist air.

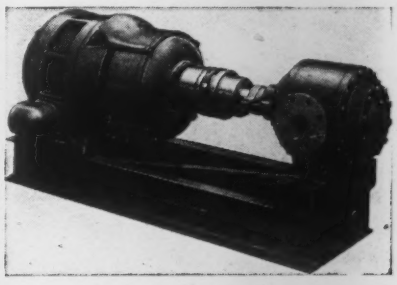
These welders also incorporate all the desirable features of General Electric indoor a-c welders of this type, including built-in power-factor improvement, fingertip adjustment, stepless current control, and fan-forced ventilation.

Blaisdell Announces New "Ben Franklin" Drawing Pencil

The Blaisdell Pencil Co., fifty-year old Philadelphia manufacturer of the popular Nick and Pull String paper pencils, is now introducing a new line of uniform "Pre-Tested" drawing pencils known as "Ben Franklin" and available in 17 degrees from 6B to 9H. "Ben Franklin" advertisements are now appearing regularly in stationers, artists, architects, engineering, students and other magazines. Consistent use of consumer magazines, plus point of purchase material as well as merchandising work by The Blaisdell National Sales Force will be continued throughout the year.

New High Pressure Rotary Pump

A new pumping unit capable of discharge pressures of 500 psi. has been designed and put into production by the Blackmer Pump Co., Grand Rapids, Mich., according to information released by J. B. Trotman, General Sales Manager of the company.

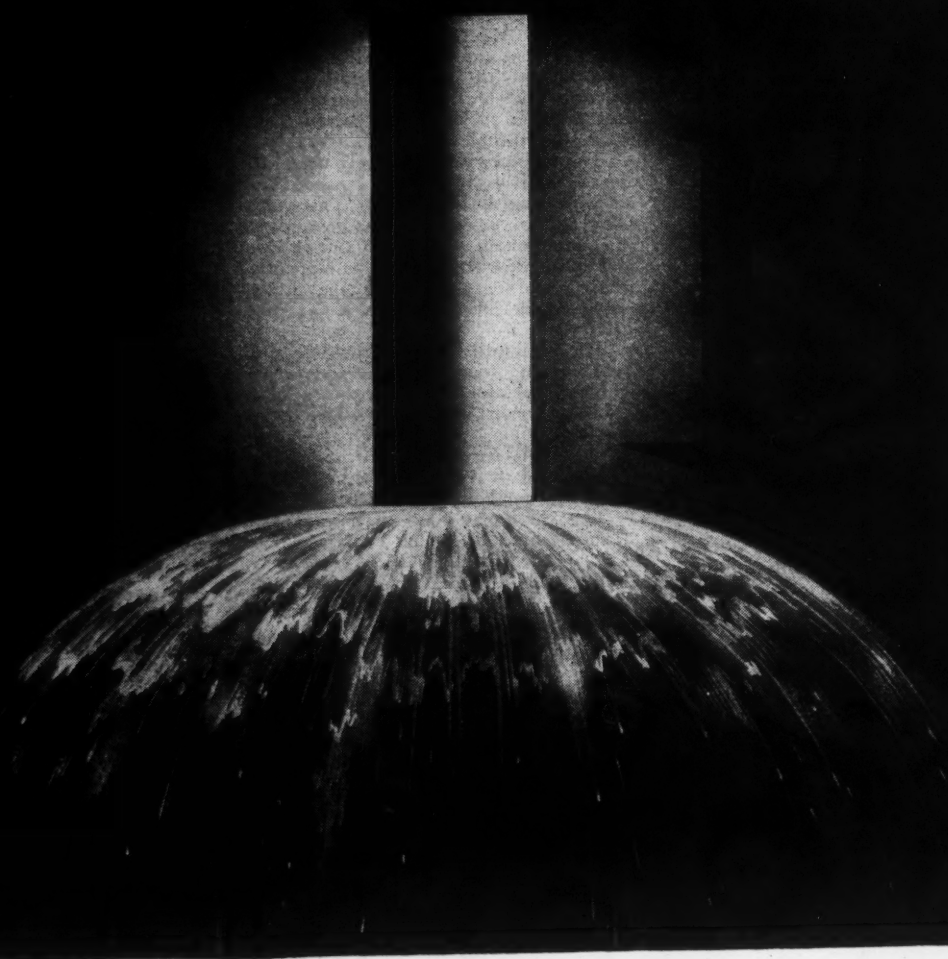


These new pumps are built in all iron and bronze fitted constructions. Rated capacities 50 and 90 GPM for discharge pressures to 500 psi. Standard motors with separate gear reduction or gearhead motors may be used. Units are also available for engine drive. While current production is entirely on the 50 and 90 GPM sizes, it is planned that large capacities will be available later.

This is the first standard pump for pressure greater than 300 psi. to be added to the Blackmer line, and is the result of extensive development work which has been carried on over the past two years. Several of the new units have been furnished for pumping oils of various types and they are designed for

Continued on Page 29

Molybdenum produces hardenability in cast steel economically because it lends itself well to close analysis control—and recoveries from scrap are high.



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue • New York City

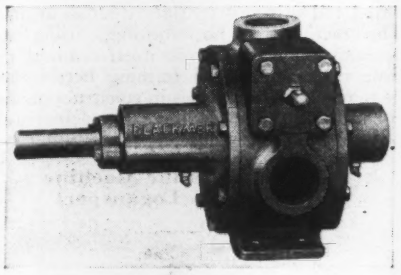
MOLY

handling similar liquids having lubricating properties.

The new pumps employ the "bucket design" (swinging vane) principle, the same as used in practically all of the standard Blackmer pumps. The casing and working parts are, of course, heavier to withstand the higher pressure.

New 35 GPM Blackmer Truck Pump

The details of a new truck-mounted pumping unit have been released by J. B. Trotman, General Sales Manager of the Blackmer Pump Co., Grand Rapids, Mich.



While the new pump differs materially in appearance and in certain details of design, from the present model, the "Bucket Design," swinging vane principle of operation that characterizes all Blackmer Pumps, is used. The outstanding construction feature appears to be the double bearing arrangement, one on each side of the rotor. This placement of bearings should virtually eliminate shaft "whip" and distortion.

The new Blackmer truck pump is compact and light in weight, making it suitable for mounting on small trucks. It is designed for standard power-take-off drive and has a capacity of 35 GPM at 525 RPM. Normal operating pressure is 45 psi. A relief valve of Blackmer Design, built into the pump casing, will by-pass the entire capacity of the pump without shock or end-thrust on the working parts, and is free from "chatter." Suction and discharge connections are tapped for $1^1/_2$" iron pipe. Provision can be made for mounting a standard Blackmer Ezy-Kleen "T" type strainer at the suction of the pump or at a convenient point in the suction line, remote from the pump.

Ashcroft Compressor-Trol

The Electro-Mechanical Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn., announces the Ashcroft Compressor-Trol. This new instrument combines seven devices for the control of compressor operations into a single, neat, compact unit. It eliminates the necessity of using pipe and pipe fitting, simplifying installation and reduces the possibility of air leakage.

It is made in three sizes, namely, $1^1/_2$", $^3/_4$" and $1^1/_4$". Sizes determined by inlet connection, to cover all requirements of tank mounted compressors up to 15 H.P. or 60 cu. ft. per minute. Equipped with sturdy Ashcroft Duraswitch, with either an electric or mechanical attachment for operating the two-way unloading valve mounted on the Ashcroft Compressor-Trol casting.

Muffler on the compressor discharges into the tank. Muffler acts to break up the discharge and to disperse the air in a manner which insures adequate mixing with the cooler gases in the tank to reduce the temperature and moisture content before delivery.

The combined Ashcroft Duraswitch and Gauge has a heavy duty gearless movement, slide rule dial, a horizontal selfdraining and nonfreezing Bourdon tube, and the entire gauge is completely removable and replaceable in case of accidental damage. Can be furnished in all standard pressure ranges.

Descriptive and illustrated catalog covering the Compressor-Trol will be sent to any interested reader.

Cooper-Bessemer's Machine Tool Casting Production Shows Scrappage Rate of Less Than Half of One Percent

The production of over 20,000 tons of machine tool castings, with scrappage at customers' plants running substantially below one-half of one per cent, was revealed in statistics made public recently at the Mount Vernon, Ohio, headquarters of The Cooper-Bessemer Corp., which operates a second foundry and engine-building plant at Grove City, Pennsylvania. The information was released by L. F. Williams, a director of the company.

A summary of customers' reports during the past four-year period shows that the wide variety of machine tool castings supplied by the company proved to be of exceptional high quality, one customer reporting a scrappage rate less than one-tenth of one per cent on a large yearly volume.

Casting production at the company's two foundries ranges from large machinery frames weighing 60,000 pounds to small machine tool accessories, like milling cutter bodies and tool shanks, weighing ounces and includes a wide variety of castings for milling machines, grinders, gear hobbers, planers, and radial drill presses.

In commenting on this unusual record, foundry authorities pointed out that improved foundry techniques, plus the advantages of Meehanite metal used for all castings, are largely responsible for this outstanding low scrap rate.

The dense, close-grained structure of Meehanite is said to lend itself particularly well to many types of cast items, exhaustive tests having proved it to be especially strong, easy to machine, and wear-resistant.

Its advantageous characteristics are reflected in the fact that very few castings are scrapped despite the rigid inspection to which they are subjected by customers who regard the slightest imperfection as justification for scrappage of the complete castings.

Cooper-Bessemer, who are exclusive licensees for Meehanite in the heavy Diesel field, use this metal in all of the castings used in their Diesel engines and compressors, and have received wide recognition for their outstanding work in the development of cast Meehanite crankshafts for replacing critical steel.

Double-Edge Milling Cutter Eliminates One Operation

A circular milling cutter, that completely eliminates one entire cutting operation in the milling of alloy hooks for water-cooled tube jackets, was recently devised by Charles Farrell at General Electric's Pittsfield Works. The improved cutter has reduced milling time more than 50 per cent inasmuch as only one cut is now required to complete the hooks.

The conventional method of milling the hooks required two operations, two separate

Continued on Page 30

Aurora Deep Well Turbines for all conditions—4" to 24"

SEE OUR CATALOG IN SWEET'S

Aurora Pumps are the products of Experience. The Aurora Personnel has but ONE objective—the building of fine pumps. We are not jacks of all trades. We are exclusive pump builders. The splendid record of thousands of Aurora Pumps on a myriad of war services is your assurance that your post-war needs will be superbly taken care of as you, too, install "Pumps by Aurora."

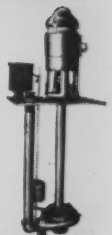
Write for CONDENSED CATALOG M

We Are Doing Our BEST for UNCLE SAM

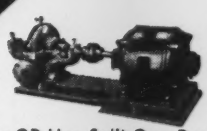
We'll Do the Same for YOU

The splendid record of thousands of Aurora Pumps on a wide variety of war services is your assurance of complete satisfaction as you, too, entrust your exacting pumping requirements to pumps "by Aurora."

We invite you to acquaint yourself with the comprehensive and outstanding line of Aurora Centrifugal and Apco Turbine-Type pumps — a size and type for practically every need in industry.



NSA Aurora Centrifugal Sump Pump



Type OD Hor. Split-Case Double Suction Single Stage Centrifugal

Type AD Hor. Split Case, Two Stage Centrifugal

APCO Horizontal Condensation Return Unit

Type GGU Side Suction Single Stage Centrifugal

APCO Single Stage Turbine-Type

Type GMC Close-Coupled Centrifugal

ARMY E NAVY

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA Always PUMPS

AURORA PUMP COMPANY

96 Loucks Street, AURORA, ILLINOIS

NEW SMALL CAPACITY BLACKMER ROTARY PUMP

2/3 to 3 1/2 GPM Pressures to 100 psi.

FEATURES

1. "Bucket Design." Special vanes make this pump self-adjusting for wear.
2. Compact—light weight. The pump fits in small mounting space.
3. Built-in relief valve is optional.
4. Furnished complete with base and prime mover or for "V" belt drive.
5. Also furnished as pump only with special mounting brackets to meet customer's specifications.

For all applications requiring small capacity, non-pulsating flow, and flexibility in mounting, this new pump adds the advantages of "*Bucket Design*" which compensates for wear, automatically.

PROMPT DELIVERY ON UNITS FOR EXPERIMENTAL USE.

Write for Bulletin NEW 2 with complete specifications on this new unit.

BLACKMER PUMP COMPANY
1920 Century Ave. Grand Rapids 9, Mich.

• Keep Informed . . .

cutting tools, and a setup change between the two cuts to alter the angle of the hook in the vice. The first cutter and operation formed the crest of the lip on the hook, and the second formed the back of the lip.

The improved single-operation cutter has two cutting surfaces which perform both milling operations simultaneously. After the original setup is completed the hooks may be milled very rapidly without change of setup or tools. The use of the double-edged cutter has considerably reduced both tool and labor costs as well as milling time.

New 6000-Ton Press

Philadelphia—A little while ago a huge 6,000-ton press, biggest up to that time, designed for bending boiler plate up to 6 inches or more in thickness, was delivered by The Baldwin Locomotive Works Southwark Division to Combustion Engineering Corporation's Chattanooga plant, which turns out unusual boilers for industry.

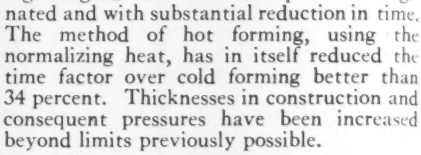
Already that record is being broken at Southwark, for a new press to form heavy plate has just been built—capable of exerting a total pressure of 8,800 tons.

In the old days it required 30 days to cold roll and form a boiler shell for riveted construction. The 6,000-ton press in use in Chattanooga cut that time to four days by hot forming. And the proposed 8,800-ton press will probably reduce the fabrication time still further, besides boosting vessel sizes and steam pressures.

This big press will be capable of bending boiler plate up to six inches or more in thickness and in lengths up to 42 feet. Its overall dimensions are 60 feet wide, 60 feet high (26 feet of the latter below ground). In other words, it is wider by five feet than the press of 6,000-ton pressure, 11 feet higher, and extends below ground four more feet.

The press consists of two 4,400-ton, four-post hydraulic presses connected by two built-up beams. The two presses operate on a 2,000-pound line pressure. One significant feature is its controls. A single operator, standing at a conveniently located battery of valves in full view of the work, controls the action of the press and plate manipulators. In spite of its tremendous size, it operates simply and fast. Industry regards the big press as a triumph in plate bending and forming. Its engineers say it produces the highest grade of workmanship so far originated and with substantial reduction in time. The method of hot forming, using the normalizing heat, has in itself reduced the time factor over cold forming better than 34 percent. Thicknesses in construction and consequent pressures have been increased beyond limits previously possible.

Special Hydraulic Machine Developed by Logansport



Illustrated above is a hydraulic gauging and assembly press, especially developed and built by Logansport Machine Co., Inc., of Logansport, Indiana, for one of the leading manufacturers of aircraft engines.

The machine has a dual function: the press fit assembly of a splined shaft into a splined hole of a disk shaped part at certain predetermined but adjustable pressures, and the disassembly for tear down inspection after green run of the engine.

Three indicating lights are provided to show the type of fit obtained. An amber light shows that the press fit is too free; a green light indicates a fit within the correct limits; and a red light indicates a fit that is too tight. The red light automatically stops the pressing stroke of the hydraulic cylinder.

The press has two independent hydraulic systems, each consisting of a motor driven pump mounted on an oil reservoir, an adjustable pressure control valve, an operating valve and a hydraulic cylinder. The two cylinders are mounted on the table top in the center and covered by a hood which also carries the pressure gauges and indicating lights. The two standard hydraulic power units are located in the base of the machine, as are also the operating valves.

The right hand of the machine is for assembling, and the left half for disassembling. The control valve for assembling is operated through electric push buttons, and the valve for disassembling through a hand lever. Two adjustable snap action type double pole heavy duty pressure switches are installed near the cylinders under the hood and actuated by the oil pressure of the assembly cylinder. These switches and a suitable contactor operate the controlling lights and stop the pressing stroke of the assembly cylinder when the press fit becomes too tight. A precision limit switch is mounted on an adjustable bracket on the work holding fixture at the right hand of the machine to prevent the red light from coming on at the end of the cylinder stroke.

Like 95% of the operators of more than 100,000 motor vehicles recently surveyed, Mr. Aramiam says he "would more than welcome a dependable self-locking nut—a nut that *can't* shake loose."

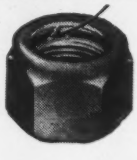
Once tight, the Boots Nut *stays* tight. Its built-in lock holds an unshakable grip—will never loosen, until you take off the nut for use again. Being 100% metal, Boots are not affected by oil, gasoline, heat or cold.

Prominent fleet operators like R. H. Macy & Co., Metropolitan Distributors, Inc., United Parcel Service and others have tested the Boots Nut over many months and *proved* how effectively it eliminates need for re-tightening.

The Boots Nut was developed and first put into production in 1942. Since no design changes are necessary for its use, you can expect Boots protection on even the *first* post-war models of trucks, buses and passenger cars.

Motion Picture—"All Work And No Play"—
16 mm. sound—30 minutes. Write for information

The ALL-METAL LOCK is Built in Here



BOOTS
SELF-LOCKING NUTS
"There's No Excuse for a Nut Shaking Loose"

Boots Aircraft Nut Corporation
Dept. A-24 · New Canaan, Conn.

Representatives in New York. Chicago. Detroit. Indianapolis. Los Angles. Keansas City. Dallas. Toronto. Montreal. Vancouver

• Keep Informed

Work holding fixtures with interchangeable locating bushings and collars for different work pieces are provided on each end of the machine as well as interchangeable support blocks for the shaft being pressed in. The motor starters for the two power units and the electric relay for the indicating lights are contained in an easily accessible panel box at the rear of the machine. A small hydraulic intensifier is installed in the base to boost the low oil pressure used for assembling to a higher value for more accurate operation of the pressure switches.

The two cylinders are made from centrifugally cast close grained iron, and their bore is honed to a mirror finish. The true and smooth bore of these cylinders, together with the accurately fitted piston equipped with low friction piston rings, as well as the self adjusting rod packing which cannot be tightened excessively, insure extremely low and uniform friction, which is necessary in order to obtain the correct relation between working oil pressure and pressing force.

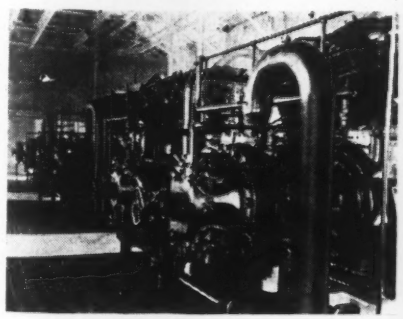
Large louvred removable side plates on the front and rear of the machine as well as removable end plates make the power units and valves in the base of the machine extremely accessible for adjustments or servicing.

The two pressure gauges with transparent plastic covers as well as the new lighter machine tool grey finish of the machine help to create a smart, modern appearance.

Mechanical Injection of Gas Increases Oil Output by 1,623,237 Barrels Over Normal Production

Information concerning a notably successful gas injection operation which recovered an additional 1,623,237 barrels of oil at the Wertz-Dome field of Sinclair Wyoming Oil Co., during the past 2½ years, has been disclosed by The Cooper-Bessemer Corp. The company, with plants at Mount Vernon, Ohio, and Grove City, Pa., is widely known as veteran engine builders and pioneers in the design and construction of heavy-duty gas and Diesel engines for industrial and marine use.

Although such projects for increasing the withdrawal rate of oil deposits are not entirely new, the operation at this field, located in the counties of Carbon and Sweetwater, Wyoming, is somewhat unique.



The chief objective of pressure-maintenance is usually to prevent or retard a decline of reservoir pressures in order to attain more efficient and greater ultimate recovery of the oil. Where hydrostatic drive is used, this includes control of water movement into the reservoir to prevent possible trapping of the oil, and the utilization of this natural energy to force the oil uniformly into the well bores. This usually restricts the rate of withdrawal, greatly prolonging the time required to recover the oil.

In order to help meet current war needs, pressure maintenance operations at the

Continued on Page 32

These Sturdy Pumps—
Find Many Uses in Steel Plants

Two instances of many where Amsco-Nagle pumps are giving superior performance in steel production operations are illustrated here.

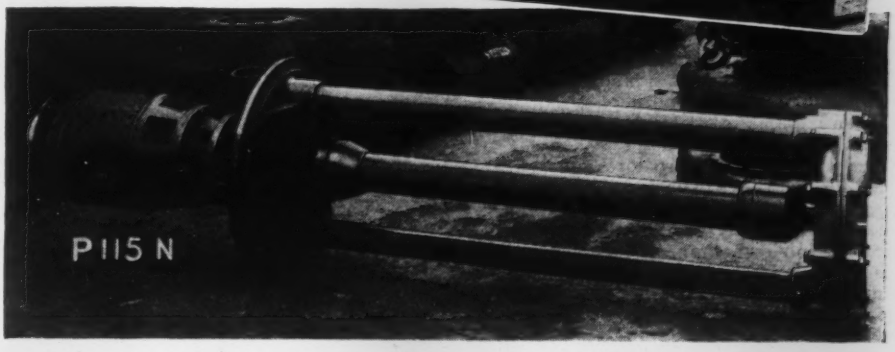
An Indiana plant employs two of the units shown in P-115-N for pumping spent spray cooling water from a sump at a pig-casting machine. This is a 5 inch Type "QW" vertical pump directly connected to a 15 horse-power motor.

The other photo P-63-N shows a horizontal type 4 inch pump coupled to a 30 horse-power motor. It has given satisfactory service for more than a year in an Ohio plant.

It removes the drainage water from a sump at a 35 inch rolling mill which contains slag and cinder drained from the floor, material usually destructive to a pump. Unlike the vertical shaft pumps previously used for the same work, this Amsco-Nagle unit need not be removed from the pit for servicing, being installed 15 feet above the water level. Self-priming, it is turned on and off by a float-control throughout a 24 hour day. Priming takes one minute, draining the sump a half-minute, and then the pump stops a half-minute before the cycle is repeated.

Amsco-Nagle fluid and material-handling pumps are made in two horizontal and four vertical types, in sizes from ¾ inch to 16 inch discharge, with impellers as large as 48 inches in diameter, for capacities up to 10,000 g.p.m. at heads up to 200 feet.

Bulletin 940 describes them all.



Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois
FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

AMERICAN
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COMPANY

Wertz-Dome field have been designed so that a volumetric balance is maintained between the oil withdrawn and the gas injected so that it will be possible to realize maximum oil recovery and deplete the reservoir in much less time than would ordinarily be required.

After a thorough study of the reservoir conditions it was calculated that 1,400 cubic feet of gas would be required to displace a barrel of oil. Thus, by returning to the deposit this volume of gas for each barrel of oil over the normal daily output of 3,300 barrels, recovery could theoretically be sustained at any rate desired without decline of pressure, and, by returning a greater volume of gas, the output could be increased.

Gas is injected to the formation through tubing by means of three economically operated, gas-fueled Cooper-Bessemer compressor units totalling 1,800 horsepower. Of the two-cycle, angle type, these six cylinder engines have a rated capacity of 2,000,000 cubic feet daily with a discharge pressure of 2,500 pounds.

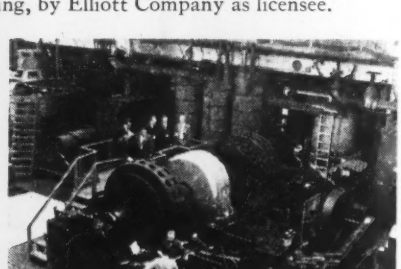
To obtain the present high rate of oil production 4,280,000 cubic feet of gas is pumped daily to the pools at a discharge pressure of 1,825 pounds per square inch.

It was pointed out by Cooper-Bessemer officials that pressure maintenance operations of this kind, if put into practice at all fields wherever practicable, would probably produce a sufficient volume of oil to meet the emergencies of war and at the same time, help relieve tightening restrictions on petroleum products for civilian and commercial use.

Such a program would be in direct accordance with the plea recently made by D. R. Knowlton, Director of Production and War Petroleum Administration, who said, "We must not only do everything possible to maintain domestic production from known fields, but also augment it by further adoption of secondary recovery and pressure maintenance projects wherever possible."

A New Device for the Reduction of Speed

A new electric device for the reduction of speed between modern high-speed prime movers and drive shafts for mechanical applications where gear and coupling combined are ordinarily necessary, is announced by the Ridgway (Pa.) Division of Elliott Co., manufacturers of power and process equipment. The drive which is the result of several years research work by Thomas D. Bowes, M.E., Naval Architect and Marine Engineer of Philadelphia, will bear his name. It is being built in two types, reversing and non-reversing, by Elliott Company as licensee.



In addition to maintaining a substantially constant speed ratio between driving and driven members of ship propulsion equipment, the new unit provides some power for auxiliary service loads through slip ring take-off circuits and can be used as a source of electrical power for operation of cargo handling and similar functions when disengaged from its primary job of speed reduction and torque multiplication of propulsion equipment.

The non-reversing type of Bowes Drive, now undergoing final tests, is available in sizes from 300 B.H.P. up.

Three main elements, concentrically mounted, comprise the drive. These are (1) an engine element which is bolted to the prime mover shaft, (2) a shaft element which is coupled to the driven shaft, and (3) a stationary element.

The engine element, which is essentially a synchronous generator rotor with poles selected for the desired speed ratio, is permanently attached to the shaft of the prime mover and revolves at the normal engine speed.

The shaft element consists of a rotating spider on which two armatures are concentrically mounted in relation to the engine element.

The inner armature, together with the engine element, form a generator. Its winding not only generates electrical energy but also transmits torque to the driven shaft of the Bowes unit.

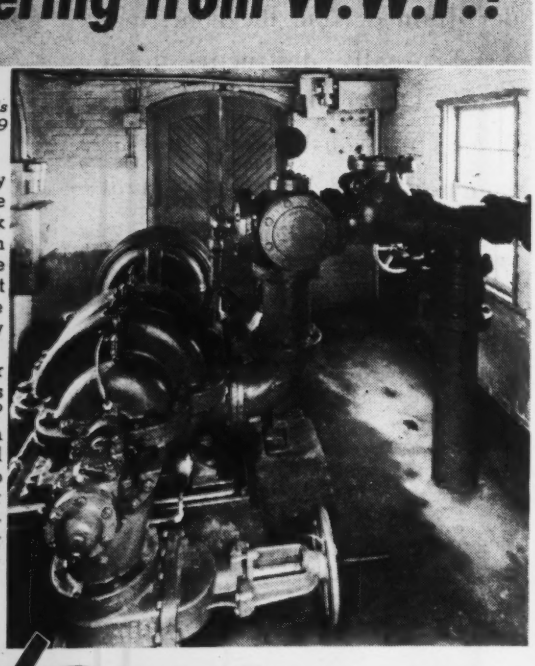
The outer armature makes use of the field of the third or stationary element to operate as a motor, converting electrical energy into mechanical energy for turning the driven shaft.

If the shaft element is held stationary the inner parts of the Bowes Drive behave like an ordinary synchronous generator and electrical energy can be taken continuously from the drive. This is particularly advantageous on a ship propulsion system where large

Goulds
the PUMP FOR the JOB

Are your pumps suffering from W.W.F.?

Installation of Goulds fire pump—Fig. 3088-99



Have your pumps been affected by "War Work Fatigue"? Has the pressure of war work forced you to overwork your pumps? Are you nursing them along while needed replacements are so difficult to obtain? Will your present boiler feed pumps, for example, still be in shape to handle the equally heavy demands of postwar operations?
When it's time to start action on your postwar plans, why not let Goulds Pumps supply the cure for W.W.F.? Goulds, who have been specializing in pump building for over 96 years, will be able to supply you with the pump for the job—whether it be for boiler feeding, hot and cold water circulating, sump, cooling tower, or any other power plant service.

Goulds PUMPS INC.
SENECA FALLS, N. Y.

• Keep Informed

amounts of power are frequently required while the vessel is in port. In normal operation, of course, the shaft element rotates at the speed desired for the driven shaft. The relative speed between the engine field element and the shaft element adjacent to it results in the generation of electric power. The reaction torque which in a normal generator would be absorbed by the frame supports is available to turn the shaft element.

The immediate application of the Bowes Drive is expected to be for ship propulsion where it will be used to reduce (by wholly electrical means) the speed of modern prime movers to lower speeds required for the most efficient operation of propellers.

At sea, the ship's electrical load can be taken from the slip rings provided at the after end of the tailshaft thrust of the Bowes Drive. This eliminates the necessity of a tailshaft generator or the operation of the ship's service generators at sea, resulting in a saving of fuel and maintenance charges.

In port, the Bowes Drive can supply electrical energy greatly in excess of that possible or economical with the usual ship generating auxiliaries. Electrical energy, up to the full capacity of the main engine at the required speed, can be generated by simply locking the shaft element of the drive.

This means that extra ship's generators can be reduced in size.

With this large source of electrical energy available without any additional capital investment, it becomes possible with an additional modest outlay to increase the size and speed of the cargo handling equipment, thereby materially reducing the time of loading and unloading—with a consequent increase in the earning capacity of the ship.

New Rotameter Flow Ratio Controller

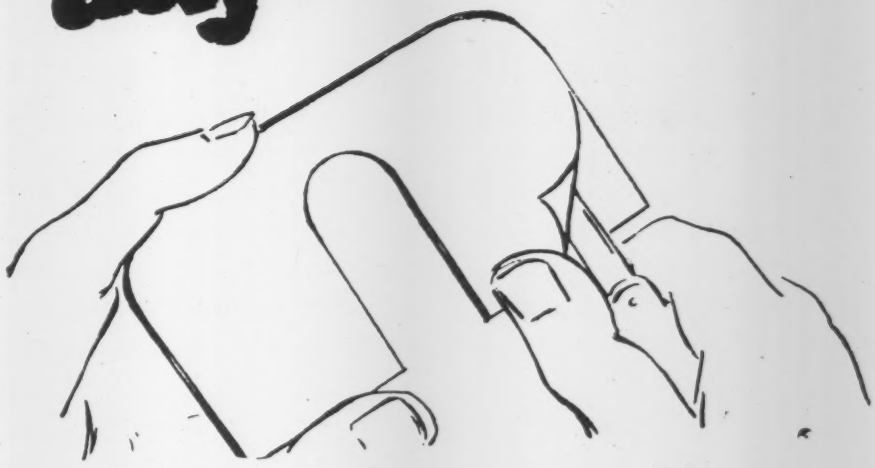
If you have a ratio flow control problem where you wish to keep one flow at a fixed percentage of a second *variable* flow, the new Fischer & Porter Rotamatic Ratio Flow Controller will do the job automatically for you. Furthermore the ratio may be varied at will by a turn of the flow ratio button. The device for doing this remarkable job of proportional control is so positive and so simple that what was once a difficult control problem has become easy and reasonable in price.

Its operation is as follows: Two rotameters with electric transmissions for remote readings are placed in the respective flow streams. The remote flow-responsive balance beams from these two rotameters are placed back to back and connected by a cross beam. From this cross beam is suspended an arm whose position may be changed at will by sliding it on the beam. This suspension arm is connected to a Rotamatic air-operated control mechanism, which in turn transmits air pressure to an air-operated control mechanism, which in turn transmits air pressure to an air-operated valve in the flow line of the stream which is to be maintained at a fixed percentage of the main flow. Thus, the position of the arm suspended on the cross beam determines the flow ratio of one stream to the other. The ratio may be readily maintained at any point from $1/5$ to one up to as high as 5 to 1 by just moving the ratio index button. Liquid flows from 1 GPM up to 6,000 GPM may be proportioned, and gas flows in equivalent volumes.

The full and interesting details in regard to the new Rotamatic Ratio Controller are told in Bulletin 50-A which will be sent to you without any obligation. Please send your request to Fischer & Porter Co., 97 County Line Road, Hatboro, Penna.

Continued on Page 35

repeated precision adjustments



LAMINUM shims make it easier to keep your factory production machine or field service machine at top form.

Shims cut to your specifications. Stock shim materials obtainable from your dealer. Write us for further information and shim application chart.

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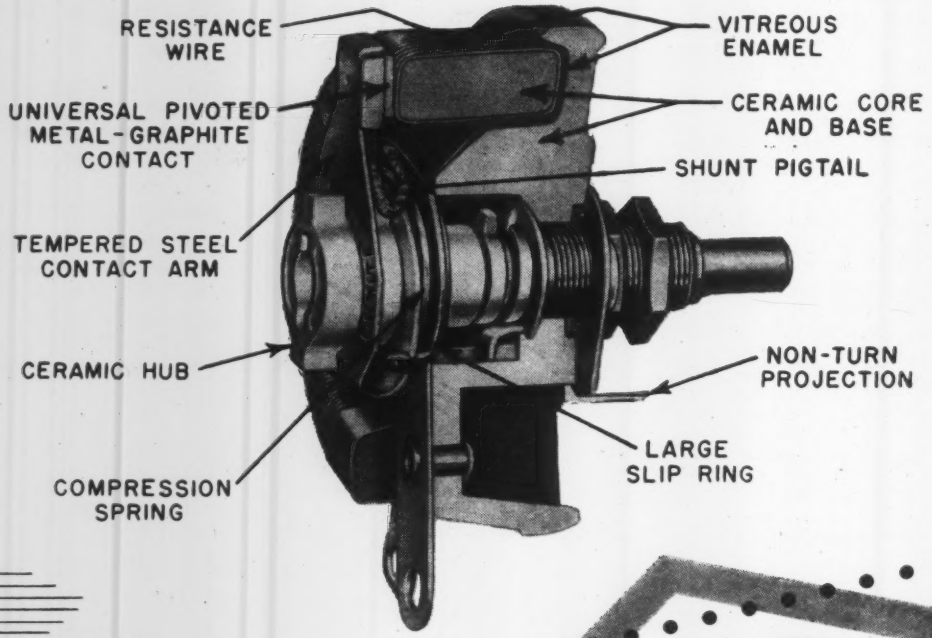
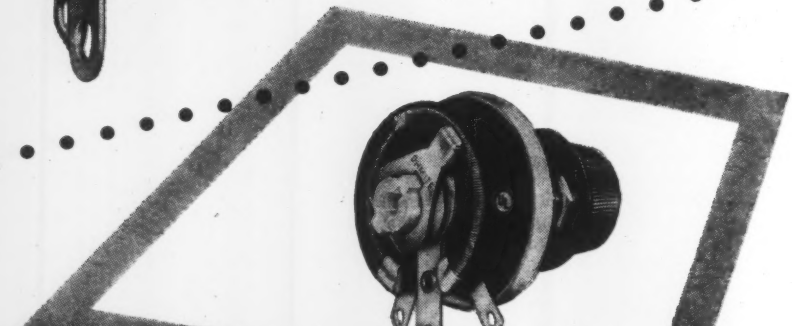
TRADE MARK

THE SOLID SHIM THAT peels FOR ADJUSTMENT

B-2039

The Inside Story of OHMITE Rheostats





OHMITE Design Makes the Difference in Smooth, Close Control

Everywhere . . . on every battle front . . . and in the tools of Industry . . . you find Ohmite Rheostats doing critical control jobs.

Permanently smooth, close control is built-in . . . to withstand shock, vibration, heat and humidity. Construction is compact . . . all ceramic and metal. There is nothing to shrink, shift or deteriorate.

Illustrated in the cutaway above are many of the features which contribute to the consistent dependability of Ohmite Rheostats.

Widest range of sizes—ten models from 25 to 1000 watts, from 1 1/16" to 12" diameter—in straight or tapered winding, in single or tandem assemblies—to meet every control need in the most advanced electronic devices.

Write on company letterhead for complete, helpful 96-page guide in the selection and application of Rheostats, Resistors, Tap Switches, Chokes and Attenuators.

OHMITE MANUFACTURING COMPANY
4808 W. FLOURNOY STREET, CHICAGO 44, ILLINOIS

Be Right With OHMITE Rheostats • Resistors • Tap Switches

Air Conditioning Increases Quantity and Quality of Production at Arcos

Philadelphia, Pa.—Air conditioning has increased the quantity and quality of stainless steel welding electrodes produced by the Paschall plant of the Arcos Corp., Philadelphia, Pa. The company makes arc welding electrodes for electric welding—an item whose essentiality is too well-known to need comment.

Qualitatively, production with conditioned air also scores higher than previously, according to the Arcos report. Rejects are down, because the system—specially designed by Carrier Corporation engineers—provides uniform air velocity and constant conditions during manufacture. Speedy drying of the four coatings on the electrode keeps it from cracking on subsequent operations. Cracking occurs if drying does not proceed sufficiently rapidly.

In the plant procedure, stiff stainless steel wire, delivered in coils, first goes through a straightening and cutting machine, which delivers rods 14″ or 18″ long. Loaded into clamps, the rods are dipped in a paste so that the metal will receive a uniform coating of flux. A number of racks holding freshly-dipped rods is then loaded on a truck and wheeled into the drying tunnel. The dipping and drying sequence is repeated four times.

The first three times, the electrodes remain in the tunnel between one and two hours, in air of 76° temperature and 58 percent humidity. The final drying takes from eight to ten hours in air of 92° temperature and 23 percent humidity.

To obtain the results mentioned, Arcos installed a Carrier system with water-cooled refrigerating machine and air conditioning equipment to obtain the low dew point air needed. The drying tunnel installation uses Ejector Nozzles for air distribution for uniform conditions of air throughout the entire drying space. The drying spaces consist of two tunnels, each 2-stage to handle the production for top quality rods.

Homestead Valve Receives Third Additional Gold Star

A third additional gold star has been awarded by the United States Maritime Commission to Homestead Valve Manufacturing Co. for their Maritime "M" Pennant.

This is the highest production award yet given to any manufacturer; and only twenty-two other manufacturers throughout the entire country share this high honor.

Of the twenty-three manufacturers who have been awarded their third gold star, Homestead Valve Manufacturing Co. is one of four which increased their production 20% or more during the past six months, as compared to the previous six months period.

Commissioner H. L. Vickery of the Maritime Commission in his letter to W. R. Schuchman, President of the Company, said, "To each and every one of the employees of your company who share in the winning of this award, I extend the appreciation of the Maritime Commission for their contribution to the Victory Fleet Program."

Kieley & Mueller Receives Maritime "M" Award

The Maritime "M" Award for outstanding production achievement has been awarded to Kieley and Mueller, Inc., North Bergen, New Jersey, and its employees, according to an announcement by the Board of Awards of the U. S. Maritime Commission. This Award, highest production honor of the Maritime Commission, is composed of the Maritime "M" Pennant, the Victory Fleet Flag and the Merit Badge for Employees in the 75 year old company's new plant. The Award was made, according to the Maritime Commission Board of Awards in recognition of Kieley and Mueller's outstanding production achievement in successfully meeting the urgent demand for valves and controls in the shipbuilding program.

Farrel-Birmingham Receives Fifth Award of Navy "E"

Again the Navy has recognized the continued excellence of the Farrel-Birmingham Co. war production record by awarding the Navy "E" for the fifth time to its three plants in Ansonia and Derby, Conn. and Buffalo, N. Y.

In the notification of the fourth renewal of this honor, Admiral C. C. Bloch, U.S.N. (Ret.), chairman of the Navy Board for Production Awards, heartily congratulated every man and woman of the Farrel-Birmingham Co. for the splendid record they have established and maintained. He stated that the determined support of all is required to back up our courageous men on the battle fronts.

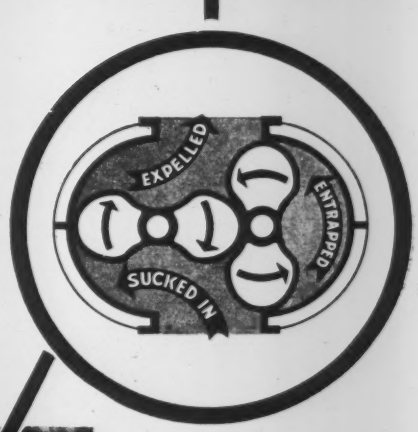
In his acknowledgment J. W. Haddock, president of the company, pledged the continued effort of the entire Farrel-Birmingham organization to produce needed equipment to meet speedily and thoroughly the requirements of the services.

The "E" award, traditional Navy symbol for a job well done, was originally made to the three Farrel-Birmingham plants in Ansonia, Derby and Buffalo in March, 1942, only three months after Pearl Harbor, and subsequently renewed in October, 1942,

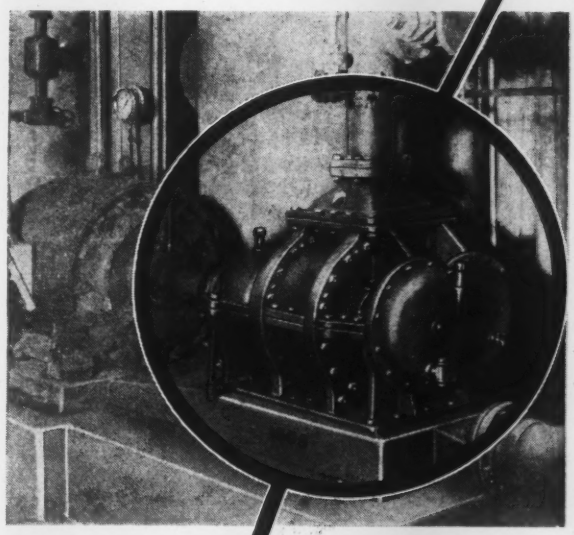
Continued on Page 36

Better Performance - Lower Power Costs

Roots-Connersville Rotary Positive Vacuum Pumps, built on positive displacement principle, operating at moderate speed and high volumetric efficiency, assure undiminished suction with lowest power consumption. Extensively used on vacuum filters because of their ability to handle air or gas and liquids in varying proportions. "R-C" Rotary Positive pumps offer many advantages where viscous liquids are handled. Write for Bulletin.



ROOTS-CONNERSVILLE BLOWER CORP.
409 MICHIGAN AVE. CONNERSVILLE, IND.



POSITIVE DISPLACEMENT

Twin impellers are rotated in opposite directions by a pair of timing gears. Each impeller alternately sucks in, momentarily entraps, and then expells a definitely measured amount of air or gas, resulting in the evacuation of four equal, pre-determined volumes each revolution of the drive shaft. Capacity varies with the speed. Impellers need no seal or lubrication. Suction is automatically built up to overcome resistance on the inlet or vacuum side. The action is continuous, with a resultant steady vacuum.

"R-C" Vacuum Pump installed in chemical plant. At 870 r.p.m. it maintains 25″ Hg. vacuum; handles 52 lbs. ammonia liquor, 1465 lbs. water with trace of caustic soda, and 6,000 cu. ft. of "free air" per hour.

Roots CONNERSVILLE SINCE 1854 Rotary Positive VACUUM PUMPS

You'll Save with LUNKENHEIMER VALVES

Economy in performance is the first essential of Lunkenheimer valve design . . . every detail is carefully planned to insure tightness and long life with lowest possible outlay of time, labor and money for maintenance.

Glance at the chart immediately following. These startling figures show what leaky valves can waste . . . and conversely what good tight valves can save. Where Lunkenheimer valves are on the job and given ordinary care, these losses are held to a bare minimum.

Always helpful is the nation-wide Lunkenheimer distributor organization. There's one near you with complete facilities to serve you.

AREA OF LEAK	AIR		STEAM		WATER	
Diameter Inches	Number of cubic feet per month at 75 lb. pressure	Total cost of waste per month 11c per 1000 cubic feet	Pounds wasted per month at 160 lb. pressure	Total cost of waste per month 65c per 1000 lb.	Gallons wasted per month at 60 lb. pressure	Total cost of waste per month 16c per 1000 gallons
1/2"	13,468,000	$1,481.44	1,219,280	$792.53	1,524,100	$243.86
3/8"	7,558,500	831.44	684,290	444.79	855,360	136.86
1/4"	3,366,990	370.37	304,820	198.13	381,020	60.96
1/8"	824,570	90.70	74,650	48.52	93,310	14.93
1/16"	213,000	23.43	19,280	12.53	24,110	3.86
1/32"	52,910	5.82	4,790	3.11	5,990	.96

Enlarged copies of chart are available on request

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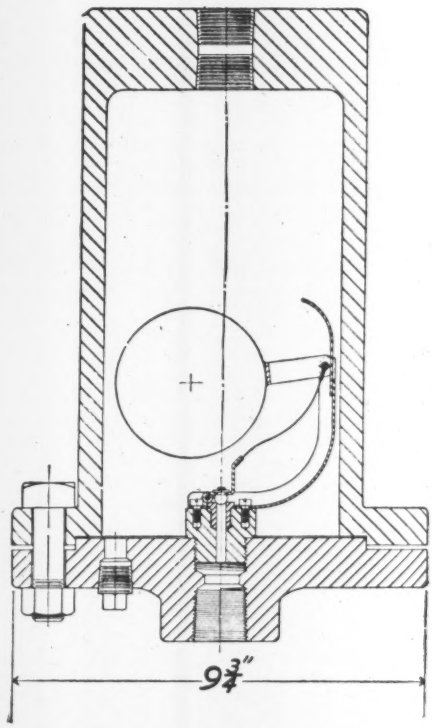
• Keep Informed

March, 1943, September, 1943 and again at the present date, each renewal adding another prized white star to the burgees which are flown over the company's plants.

In addition to making marine gear drives, the company builds heavy machinery for other war production plants in the steel, non-ferrous metal, rubber, plastics, paper and other industries.

New High Pressure "Snap-Action" Air Trap



A new High Pressure "Snap-Action" Air Trap, No. 71-315, for draining water from compressed air systems under pressures up to 1000 lbs., has been announced by the Armstrong Machine Works, Three Rivers, Mich. The body and cap of this trap are forged steel and the ball float is designed to withstand hydrostatic pressures of 1500 lbs.

The ball float is connected to the short valve lever through a flat strip of stainless steel spring. As the incoming water raises the ball float, the initially concave bent spring is so attached to the float that as the spring moves past dead-center it snaps the float up and the valve is thrown wide open. Drainage is immediate. When the water level drops, the cycle is reversed and the valve snaps tight in closing. No throttling effect occurs and it is claimed that wire drawing is eliminated. It is also claimed that the trap will handle all ordinary oil and dirt without clogging.

The company also manufactures a complete line of ball float, inverted bucket and snap action air traps for pressures up to 250 lbs.

New Price Reduction of Hycar Butadiene Synthetic Rubber Makes Its Advantages Still More Widely Available

Akron, O.—A further reduction in the prices for synthetic crude rubber made by Hycar Chemical Co. announced today, lowers the cost by approximately 10 percent and represents the fourth drop in price since August 1941.

The substantial reductions in the price of synthetic rubber have been made despite the

Keep Informed

fact that demand has greatly exceeded supply and cost has been a matter of little consideration, Frank M. Andrews, general sales manager of Hycar Chemical Co., pointed out.

The new prices for Hycar, a special-purpose synthetic crude rubber are: Hycar OR-15, 50 cents a pound; OR-25, 45 cents and OS-10, 45 cents. The price reduction coincides with rubber order R-1 released July 1, making rubbers of the butadiene-acrylonitrile type available on a more liberal basis.

Hycar Chemical Co., largest independent producer of butadiene synthetic rubber in the country, furnishes crude synthetic rubber to most of the large rubber goods manufacturers.

Under the force of necessity, development of synthetic rubber has progressed so far that there is no doubt in Mr. Andrews' mind but what it will be one of the important new post-war materials just as it is now a vitally important war material.

"Improvements are coming daily in production methods, in crude material and compounding technique. The situation is dynamic," he declared. "This is reflected in lower prices and greatly improved quality of Hycar synthetic rubber."

Long before Pearl Harbor, special purpose synthetic rubber was being used in applications for which natural rubber was not suited, especially where resistance to oil and gasoline was required. Some of the typical applications, representing every important industry are: abrasive wheel binder; artificial leather; bearings; brake linings; clutch facings; belts; containers; diaphragms and valve discs; engine mountings; gaskets; hose; impregnated paper; packings; tubing; wire covering.

The ability to turn out man-made rubber at lower prices, and the new uses which engineers are finding for the material, are constantly widening its value, declared Mr. Andrews, who expects the day is not long off when synthetic rubber will be accepted by the public, as it now is accepted by many engineers, for its own inherent qualities rather than as a substitute for natural rubber.

Another Star for Illinois Gear

The Illinois Gear & Machine Co., 2108 N. Natchez Ave., Chicago, Ill., manufacturers of cut gears of all types, has just been awarded the Army-Navy "E" flag for the third time as announced by V. P. Reilly, president of the firm.

The second star signifies that the company has maintained its high production standards in making war material since February, 1943, when it won its first award.

High quality gears for gun turrets and Army and Navy ordnance of many types make up the company's war-time production.

Navy Renews De Laval "E" for Fourth Time

In recognition of the splendid production record that has been established and maintained since the award of the original Navy "E" to the De Laval Steam Turbine Co., Trenton, N. J., two years ago, a Fourth "E" Star has been conferred upon that company. The company has been advised that in view of the excellence of its production record this fourth renewal has been granted for a period of one year, rather than for the customary six months period.

The products furnished by the De Laval Steam Turbine Co. to the U. S. Navy include: marine propulsion gears, steam turbines, centrifugal pumps, centrifugal compressors, worm gear speed reducers, and IMO oil pumps.

Continued on Page 38

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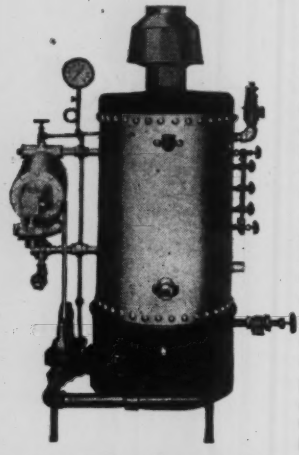

What more can you ask? The safe, efficient MKayO boiler fills every specification for a boiler its size—it supplies clean steam . . . it's easy on fuel. Which size do you require? If you say the word, our Engineering department will recommend the size boiler best suited to your needs—please outline your requirements fully, so we can reply intelligently.

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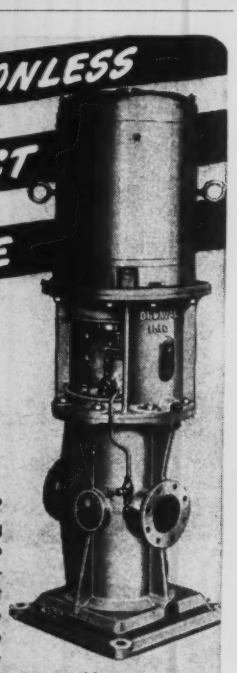

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1 MOVE OIL

The DE LAVAL ROTARY OIL PUMP has only 3 moving parts, no gears, no valves and no separate bearings. It propels any grade of oil in any volume in a smooth, steady stream against any pressure, like a piston moving always in one direction. The IMO motor-driven pump here shown is one of five in lube oil service on each of the largest and fastest Great Lakes ore carriers.

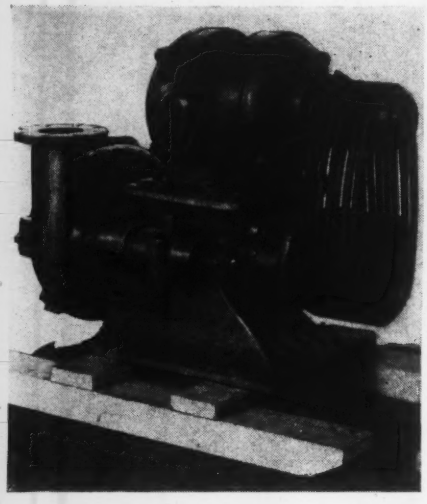
Ask for Publication I-106

IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton, New Jersey

• Keep Informed . . .

Amsco-Nagle Centrifugal Pumps Now Available with Motor Mounted Overhead

Previously available with motor directly coupled to the impeller shaft or with "V" belt pulley, flat pulley or sprocket on the shaft, Amsco-Nagle Centrifugal Pumps of the horizontal type are now available with the motor mounted overhead as shown.



This new arrangement offers the following advantages, according to the engineers responsible for its design. Pump can be operated at more accurate speeds. Speed changes can be provided where the duty calls for such changes. Motor is stationed at a more accessible point and is at the same time protected against flooding. Too, this arrangement requires less floor space for installation.

The Manufacturer's Type "A" and Type "T" pumps, both horizontal, are available with this motor mounting. A 5" Type "T" pump shown.

Amsco-Nagle Pumps are made by the American Manganese Steel Division of the American Brake Shoe Co., Chicago Heights, Ill.

Cochrane Awarded Star for "E" Flag

The employees and management of the Cochrane Corp., Philadelphia manufacturers of water conditioning apparatus, steam power plant equipment and flow measuring instruments, have been notified by the Navy Department of the renewal of the "E" Production Award granted last February, signified by the addition of a star to their "E" pennant.

• BUSINESS CHANGES

Priestley Elected President of Electro Metallurgical Co.

New York.—William J. Priestley has been elected President of Electro Metallurgical Company, Electro Metallurgical Co. of Canada, Ltd., Michigan Northern Power Co., and Union Carbide Co. of Canada, Ltd., Units of Union Carbide and Carbon Corp. Mr. Priestley succeeds the late Francis P. Gormely.

Mr. Priestley was graduated from Lehigh University in 1908 with a degree in metallurgical engineering, and entered the employ of Bethlehem Steel Corp. He became superintendent of the armor plate plant and was subsequently division superintendent in charge of all ordnance production for that company. During World War I, he entered Government service and became the civilian head of the Armor Plate and Ordnance Plant erected by the United States Navy. Later, Mr. Priestley managed a steel plant making high-grade alloy steels for the automotive industry.

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Power Plants, Public Utilities, Industrial Plants
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Architects and Engineers
New Haven, Conn.

RATE Annuoncements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

• Keep Informed

In 1923 Mr. Priestley became consulting metallurgist for Electro Metallurgical Co. He became Vice-President in charge of Sales Development in 1932. Mr. Priestley was chief of the Alloy Steel Division of the War Production Board during the period of organization for the expansion of alloy steel production in 1942.

Throughout his business career, Mr. Priestley has taken a leading part in extending the uses of stainless and alloy steels.

LeVan Elected President of Haynes Stellite Co.

New York.—E. E. LeVan has been elected President of Haynes Stellite Co., a Unit of Union Carbide and Carbon Corp., succeeding the late Francis P. Gormely.

Mr. LeVan was graduated from Pennsylvania State College in 1917, with a degree in mechanical engineering. After spending five years as a mechanical engineer with Bethlehem Steel Co., he entered the employ of Haynes Stellite Co. as a sales engineer in 1922, becoming Chief Engineer three years later. In 1927 Mr. LeVan entered the Sales Department, and in 1929 became General Sales Manager. He was elected Vice-President in 1939, and on May 22, 1944, was made Vice-President and General Manager, and a director of Haynes Stellite Co. Mr. LeVan will continue to make his headquarters at Kokomo, Indiana, where the general offices and plant of Haynes Stellite Co. are located.

For many years Mr. LeVan has taken a leading part in making available to industry the advantages of the Haynes Stellite chromium-cobalt-tungsten alloys and other special alloys and metals for resistance to abrasion, corrosion, and heat. Remarkable progress has been made in this field during the past few years. Many developments, however, now are unavailable for general use for the duration of the war, since practically all of these have been of extraordinary importance to the armed services, particularly the Navy and the Army Air Corps.

Mr. LeVan is a member of the Society of Automotive Engineers and the American Petroleum Institute. He is the author of a number of articles on metallurgical and mechanical engineering subjects.

Swanson Elected Vice President of Graver Tank & Mfg. Co.

E. N. Gosselin, President of Graver Tank & Mfg. Co., Inc., East Chicago, Indiana, has recently announced the election of J. E. Swanson as a Vice President of the company, by the board of directors at their Annual Meeting.

Mr. Swanson, who has been with the company for more than twenty-five years, has served in various executive capacities for the organization, having most recently held the position of General Manager of Sales. His election as a Vice President of Graver will be of interest to his many friends and associates throughout the entire steel, chemical and petroleum industries.

J. S. Bennett Elected Vice President of A-E-CO.

Joseph S. Bennett, recently Manager of Sales of the American Engineering Co., Philadelphia, has been elected Vice President. Mr. Bennett has been connected with A-E-Co. successively as draftsman, Assistant Construction Engineer, Assistant Mechanical Engineer and Manager of Sales.

His B.S. in M.E. and M.E. were received from the University of Pennsylvania, where he is now a special lecturer at the Graduate School. Author of many papers on technical subjects, Mr. Bennett holds 31 patents in

Continued on Page 40

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the United States and 106 patents including foreign countries.

He was a First Lieutenant of Combat Engineers in World War I and is a member of the American Society of Mechanical Engineers, Society of Naval Architects and Marine Engineers, American Society of Naval Engineers, Franklin Institute and the Engineer's Club of Philadelphia.

Geiser Returns to Tube Turns

Wilbur E. Geiser, who has been on loan for the last eight months to the scheduling department of the War Production Board's valve and fittings section, with headquarters in Washington, has returned to his post as manager of the Philadelphia office of Tube Turns, Inc., Broad Street Station Building. Geiser's fifteen years' association with Tube Turns includes considerable shop experience as well as sales contacts.

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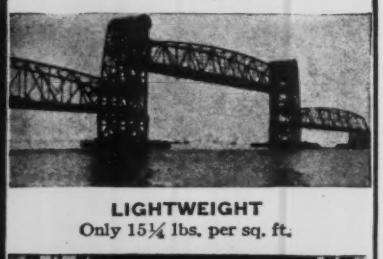

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Mesinger Elected Norma-Hoffmann Vice President

Norma-Hoffmann Bearings Corp., Stamford, Conn., at its Directors' Meeting on June 17th, elected Mr. Frederick W. Mesinger a Vice President, succeeding Mr. H. J. Ritter who recently resigned. Mr. Mesinger takes up his new duties after some 24 years' connection with the firm's Engineering staff, and for the past 16 years has been District Manager of the New York office. He is a member of the American Society of Mechanical Engineers, of the Society of Automotive Engineers, and of the Army Ordnance Association; and he is an Associate Fellow of the Institute of Aeronautical Sciences.

Batesole Now Norma-Hoffmann Vice President

Norma-Hoffmann Bearings Corporation, Stamford, Conn., announces the election, at its Directors' Meeting on May 16th, of Mr. D. E. Batesole as Vice President and Chief Engineer. Mr. Batesole has been a member of the firm's Engineering Department for over 25 years, and has been Chief Engineer since 1937.

Frank E. Bell Is Appointed Hycar Technical Service Engineer

Akron, O.—Frank E. Bell has been appointed technical service engineer for Hycar Chemical Co., largest independent producer of synthetic rubber from butadiene, it was announced today by Frank M. Andrews, general sales manager for the company.

Mr. Bell, who has had 13 years' experience in the rubber industry, comes to Hycar from the Barrett division of Allied Chemical and Dye where he was employed four years as technical service representative. Prior to that time he was with the Bolta Corp., Johnson Rubber Co., and Aetna Rubber Co.

Mr. Bell was graduated from Case School of Applied Science in 1931 with the degree of B.S. in chemistry and did special work at Massachusetts Institute of Technology. He is a member of the Rubber Division of the American Chemical Society.

Hycar Chemical Co. was established in 1940 and is engaged solely in the manufacture of crude synthetic rubber, which it sells to fabricators, who process it into a wide variety of finished rubber products.

Tube Turns Reopen Los Angeles Office

Tube Turns, Louisville, Ky., announces the reopening of its Los Angeles office in the Van Nuys Building with James H. Withers in charge. For the last nine years Withers has been associated with valve, fitting, and industrial supply firms in the West Coast area. He is a graduate of the University of Southern California.

Foxboro Company Adds to New England Sales Force

The Foxboro Co., manufacturers of industrial instruments for measurement and control, announces the addition of Mr. Paul Torre to the staff of sales engineers covering the New England territory.

Mr. Torre brings to his new work a background of useful experience covering nearly 25 years, many of them devoted to technology and production control, especially in pulp and paper mills. His headquarters will be at the New England District Office of The Foxboro Co., at Foxboro, Mass.

New Cherry Rivet Representatives

President William B. Hubbard of the Cherry Rivet Co. of Los Angeles, Calif., has just announced the appointment of new resident representatives in New York City and Detroit, Mich.

In charge of the Detroit territory will be William M. Rosborough, M.E. with offices in 704 Stephenson Building. Mr. Rosborough has been connected with the automobile industry for a number of years in the development of new products, among them some of his own inventions.

COMING MEETINGS AND EXPOSITIONS

During the next three months

SEPTEMBER

27–29	American Management Association, Personnel Conference, Hotel Pennsylvania, New York, N. Y.

OCTOBER

2–4	The American Society of Mechanical Engineers, Fall Meeting, Hotel Netherland Plaza, Cincinnati, Ohio
5–6	American Institute Mining and Metallurgical Engineers, Iron and Steel Division, Second Annual Conference Electric Furnace Steel Committee, William Penn Hotel, Pittsburgh, Pa.
12–14	American Society of Tool Engineers, Syracuse, N. Y.
16–18	American Institute of Mining and Metallurgical Engineers, Institute of Metals and Iron and Steel Division, Cleveland, O.
16–19	American Welding Society, Annual Meeting, Hotel Cleveland, Cleveland, Ohio
16–20	American Society for Metals, National Metal Congress and War Conference Displays, Statler Hotel, Cleveland, O.
17–18	American Management Association, Office Management Conference, Hotel Pennsylvania, New York, N. Y.
30–31	Joint Meeting A.S.M.E. Fuels and A.I.M.E. Coal Divisions, Charleston, W. Va.

NOVEMBER

13–16	American Petroleum Institute, 25th Annual Meeting, Stevens Hotel, Chicago, Illinois
14–15	American Management Association, Production Conference, Hotel New Yorker, New York, N. Y.
15–18	Society of Naval Architects and Marine Engineers, Annual Meeting, Waldorf Astoria, New York, N. Y.
27–Dec. 1	The American Society of Mechanical Engineers, Annual Meeting, Hotel Pennsylvania, New York, N. Y.

FRASER-BRACE ENGINEERING CO., Inc.

Design, construction and installation of complete plants and projects

Mechanical, Heavy Industries, Shipbuilding, Hydro-Electric Developments, Power Plants, Chemical and Refining Plants, Process Industries, Metallurgical Developments and Processes, Explosives, Plastics, Water Supply and Treatment, Sewage and Industrial Wastes Treatment.

• REPORTS • APPRAISALS • CONSULTING •

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• Keep Informed

In the New York territory, Harold B. Thomas and P. J. St. James will conduct their operations from 80 Broadway, New York City. For several years, Mr. Thomas has been connected with the Cherry Rivet Co. in an advisory capacity. Mr. Thomas was formerly connected with the Elastic Stop Nut Co. of Union, N. J.

Among the duties of these resident representatives will be the extension of the use of Cherry Blind Rivets, pull rivets and accessory riveting tools to peace-time industry for postwar production.

• LATEST CATALOGS

New Kron Scale Catalog Spotlights "Hidden Losses"

A new, complete and factual catalog of Kron Scales made by Yale has just been prepared for the use of buyers of precision industrial equipment who are interested in investigating the benefits and savings of Kron Scales used as an integral part of a materials handling program.

Now ready for distribution, this catalog presents the full story of the entire Kron Scale line from dormant and portable platform types of special counting, batching, tensile strength and dynamometer models. Fully illustrated with complete specifications and dimensions of every standard Kron Scale, it is a valuable reference book for every business.

The importance of industrial scales in modern production methods is briefly summed up in the following excerpt from the foreword to the catalog. "Weighing, counting and measuring bulk and unit materials are too often 'red ink' production costs—hidden losses that are found in many industrial handling practices. . . . True weight, when quickly and accurately measured, helps to erase these hidden losses . . in materials saved, time conserved and mistakes eliminated."

In promoting a better understanding of the wide range of applications and the savings in production costs which follow when Kron springless industrial dial scales are used, the Yale & Towne Manufacturing Co., makers of Kron Scales, will be glad to send this catalog to any executive interested in increasing the efficiency of his own materials handling program through the use of precision industrial scales. Address your request to The Yale & Towne Manufacting Co., Philadelphia Div., 4530 Tacony Street, Philadelphia 24, Pa., and ask for catalog R-44 which will be mailed to you at no obligation.

Combustion Control Discussed

The great importance of simplicity and coordination in the control of combustion is stressed in new Bulletin BD44 issued by the Engineer Co.

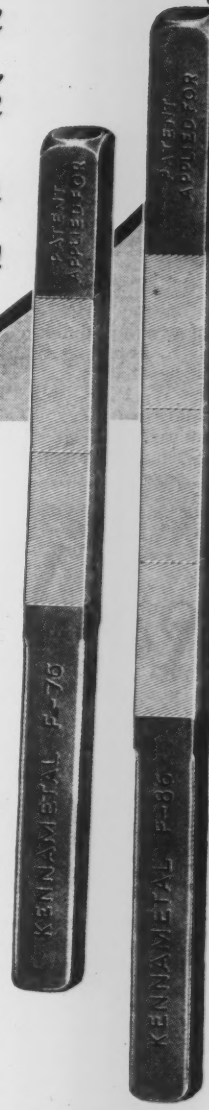
Discussing the problems of the modern power plant, this bulletin points out the value of automatic or semi-automatic regulation of furnace draft, fuel feed and steam pressure and offers a complete system for co-ordinating these three phases of boiler operation.

The system calls for a sensitive, compensated steam pressure regulator, a responsive control of furnace pressure and a device for assuring correct fuel feed to carry the load. While the introduction of any one of these three elements alone will increase the effectiveness of combustion, it is claimed that correct application of all three of the Enco units described will result in maximum efficiency with appreciable savings.

Continued on Page 42

KENNAMETAL *Lathe File Does as Much Work as 150 Mill Cut Files*

...AND PRODUCES A BETTER FINISH!



Comparative service tests continue to prove convincingly that Kennametal lathe files multiply production, improve quality of work, and effect substantial savings in the cost of files used. For example, on the job illustrated above:

A mill cut steel file, employed to remove the sharp edges from the 400 Brinell steel part, wore out on about 100 pieces. A Kennametal file turned out 800 pieces the first day—stayed on the job two weeks—and produced 15,000 pieces. The Kennametal file cut a curling chip—did not scrape or skid—and provided a finish that was almost as smooth as a grinding job!

Kennametal lathe files outlast steel files 50 to 200 times, because their surface is made of the same hard, cemented carbide composition as steel-cutting Kennametal-tipped tools. They permit filing speeds 3 to 10 times those possible with steel files—doing an outstanding job on cast iron and brass at surface speeds around 900 feet per minute, and on high-carbon, high-chromium steels at 800 surface feet per minute. The keen, sturdy teeth of a Kennametal file will make a clean, true cut on steels up to 62 Rockwell C, a hardness that ordinary files cannot touch.

The value of any tool is measured by the quality and quantity of work it produces. The higher original cost of Kennametal lathe files is insignificant compared to the tremendous economies effected through their use. Order one today for test purposes—let it prove its merit in your shop.

Kennametal Lathe Files are now furnished in two sizes—11" or 14" long—and each size is available with either 20 or 30 teeth per inch. The 11" size (F-76, 30 teeth/inch; F-77, 20 teeth/inch) having a filing surface 4" long x ¾" wide, costs $12.50. The 14" size (F-86, 30 teeth/inch; F-87, 20 teeth/inch) having a filing surface 6" long x ¾" wide, costs $18.50. All sizes can be shipped promptly.

KENNAMETAL
SUPERIOR CEMENTED CARBIDES
KENNAMETAL Inc., LATROBE, PA

For regulating the flow of air into the combustion chamber the bulletin recommends the Enco Balanced Draft Furnace Regulator. This device, installed on the outside of the furnace wall, has a tube or duct leading directly into the combustion chamber. A weighted, swinging diaphragm, responding sensitively to changes in pressure in the furnace, immediately adjusts the outlet damper of the boiler to maintain the correct furnace pressure.

Another device described is the Enco Steam Pressure Regulator. Utilizing variations in boiler-header pressure, the Regulator is used to control either the rate of air supply or fuel supply.

The third unit shown in the bulletin, the Enco Stoker Speed Control, keeps air and fuel supply closely in step, adjusting them promptly for changes in load. This device, applicable to either steam or motor driven stokers, is controlled by fluctuations of the boiler damper.

Diagrams show application and operation of these three control units. An impressive list of users of Enco Regulators is included in the bulletin.

Copies of Enco Combustion Control Bulletin BD44 may be had on application to The Engineer Co., 75 West Street, New York 6, N. Y.

Safety Valves

Information Bulletin 501-A, just released by J. E. Lonergan Co., is an interpretation of the new Safety Valve Standards developed under W. P. B. and National Bureau of Standards auspices. Tables I, II, and III summarize the sizes, connections, service limits, and other standard specifications set up for each type of valve. Lonergan designs corresponding to the official standards are described and illustrated. Miniature "blueprints" of each design are included. Copies may be obtained by writing the J. E. Lonergan Co., 2nd & Race Sts., Philadelphia 6, Pa.

General Electric Cabinetrol Featured in New Publication

The G-E Cabinetrol, a new, simplified system for providing motor control for complex industrial processes, is the subject of a 24-page illustrated bulletin (GEA-3856) recently issued by the General Electric Co.

The publication describes how most control systems can be built up by combining standard control units and accessories into the required number of Cabinetrol sections. The publication also lists the many uses of the Cabinetrol, and explains in detail how the equipment is manufactured.

A section of the bulletin is devoted to a set of layout tables which show how simply most installations can be made, while another section lists the compartment sizes of the standard Cabinetrol units.

General Electric's Arc-Welding Accessories for Men and Women Operators

One of the largest and most complete lines of arc-welding accessories ever offered by one supplier is presented in a striking new 36-page bulletin (GEA-2704C) issued by General Electric Co.'s Welding Division. With a cover showing both Joe and Josephine Magee—General Electric's well known little co-workers who symbolize America's mighty army of men and women welders—the bulletin comprehensively describes all the standard, as well as the many new G-E arc-welding accessories now available.

Prominently featured in this well-illustrated publication is the full G-E line of chrome-leather, asbestos, and flameproofed-duck protective clothing for both men and women operators. Rangling from gloves and sleevelets to complete ensembles, both types of this clothing are designed for comfort, are sturdily constructed, and offer the fullest possible protection to the wearer. Included in the women welders' line is the smart Sally Victor hat of flameproofed blue denim.

Among the other items illustrated and described in the publication are ventilated helmets and head protectors, observation shields, electrode holders, and various kinds of miscellaneous welding equipment such as slag chippers, electrode carriers, and fillet-weld gages. Also listed are standard sets of welding accessories and renewal parts for these accessories.

General Electric's Amplidyne Featured in New Bulletin

The amplidyne, a G-E engineering development which harnesses the usually troublesome short circuit and puts it to work, is the subject of an attractive new 36-page bulletin (GEA-4053) recently issued by the General Electric Co.

Profusely illustrated, the publication describes comprehensively the engineering details and fundamental functions of the amplidyne, which in principle is an externally driven direct-current generator which uniquely uses a short circuit and a compensating winding. It also lists several of the amplidyne's typical applications, and in

• Keep Informed

many cases cites figures showing the gain in production levels made through the use of the amplidyne.

The final section of the publication is devoted to a series of interesting diagrams, with explanatory notes, showing how the amplidyne is employed, in conjunction with other equipment, in various applications.

Synchronous Motors and Control for Compressor Drives Featured in New G-E Bulletin

Low-speed synchronous motors and control for compressor drives are featured in a new 4-page bulletin (GEA-4139) recently issued by the General Electric Co.

The well illustrated publication describes the application of low-speed synchronous motors, emphasizing the necessity of providing in the installation the proper amount of flywheel effect to avoid excessive current pulsations; lists the most important construction features, especially in respect to the rotors and stators; and discusses the synchronization, field removal, and motor protection afforded by the G-E synchronous motor control.

New Book on Fastenings

A new catalog and data book on self-locking nuts that is practically an engineering handbook has just been issued by the Elastic Stop Nut Corp. of America, and is available to users of fastenings. The book covers the hex, anchor, and clinch types of nuts, and contains a wealth of material that every design engineer will appreciate, because it puts in easy-to-find form all of the data necessary for the intelligent planning of vibration-proof connections.

Present applications of the ESNA nuts, showing how they solve difficult fastening problems, are illustrated. Suggestions for typical applications will help designers and purchasing men plan their postwar products so as to eliminate the dangers and annoyances of loose bolted connections. ESNA's engineering staff offers additional help to meet any design problem.

Size, material, class fit, axial load strength based on pull-test data, military requirements, weight, finish and other information on ESNA self-locking nuts is given in handy, tabulated form that will save design engineers much time and figuring.

Copies of the book can be secured by writing the company at Union, New Jersey.

Worm Gear Reduction Units

Catalog No. 300 issued by The Cleveland Worm & Gear Co., Cleveland, Ohio, is a comprehensive exposition of Speedaire Fan Cooled Worm Gear Reduction Units. The Speedaire principle is fully detailed by means of cutaway photographs, charts, diagrams and engineering tables.

With Speedaire, heat generated during the operation of the unit passes through the oil bath to the deeply-finned wall of the reservoir. An exhaust fan on the coupling end draws a continuous stream of air at high velocity between the double walls that form the lower half of the unit, completely scouring the surface and providing an effectual transfer of heat.

The catalog states that as the result of this improved cooling, smaller sizes of Speedaire units may be applied to a given installation than have been possible heretofore. In some cases it is claimed that the new units offer as much as twice the capacity of standard worm gear units of equal frame size when operated with 1750 r.p.m. motors.

Following the explanatory and descriptive material which comprises the first portion of the book, the design engineer will find

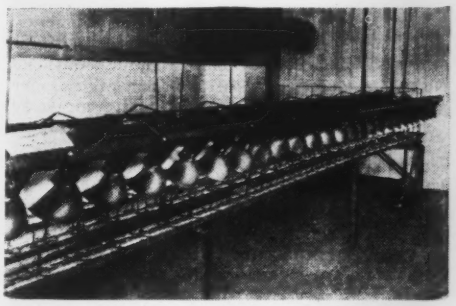
Continued on Page 44

MATERIAL HANDLING

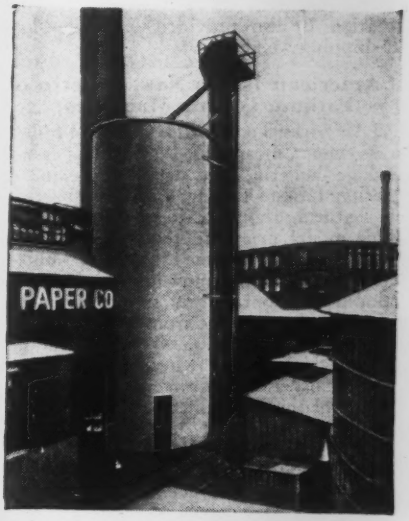
A Field for Industrial Progress ★

By R. W. MALLICK,
WESTINGHOUSE ELECTRIC & MFG. CO.
Member A.S.M.E.

"Material handling is the greatest single item of labor cost in most industries. In the United States alone it constitutes about 22 per cent of labor costs and represents approximately a 4-billion-dollar payroll annually."



Above: G-W Conveyors through tunnel of Infra-Red Lamps



Above: G-W Silo Storage Served by Reciprocating Feeder under Track Hopper and Centrifugal Discharge Elevator

MR. MALLICK'S figures are based upon facts from research reports of material-handling cost studies in American industry. These facts relate to "man-handling"—the wasted motions and efforts expended by human beings unnecessarily handling products in the course of manufacture.

There are many industrial plants, however, that have speeded up handling and cut costs by obtaining "continuous-flow" operations with Gifford-Wood conveyor and elevator systems. These companies have availed themselves of the cooperation of G-W engineers, and G-W experience of 130 years in design, construction and installation of a mechanized material handling system to replace a considerable part of their more costly manual handling operations.

Perhaps engineering ingenuity can be applied to your handling of raw materials—materials in storage—finished goods . . . to the point where only the most essential, intricate handling need be done manually . . . the more laborious and costly operations being mechanized by an individually designed and built G-W system.

Why not discuss such a project with a G-W Engineer? Suggestions, layouts and estimated costs gladly made without obligation. Data Book 200-M mailed on request.

★ *Excerpt from paper presented at ASME Semi-Annual Meeting, June 19-22, 1944, Pittsburgh, Pa., and printed in MECHANICAL ENGINEERING, July 1944.*

GIFFORD-WOOD CO.

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Ash Spouts • Barge Unloading • Bins • Boiler House Equipment • Buckets • Bunkers • Carriers
Chutes • Conveyors • Crushers • Elevators • Feeders • Gates • Ground Storage Systems • Hoists
Hoppers • Infra-Red Drying Systems • Screens • Silo Storage Plants • Tanks • Weigh Larries

6242

carefully detailed instructions for planning installations of Speedaire units, with illustrative examples. Supplementing these instructions are rating tables for six sizes ranging from 4¾" to 12" centers. Full information is also provided on dimensions and shipping weights.

All American Issues New Bulletin on Fatigue Testing Machines

All American Tool & Mfg. Co., 1014 Fullerton Avenue, Chicago 14, Ill., has just issued a 4-page bulletin, No. 610, on its line of vibration fatigue testing machines, particularly featuring the new Model 10HA.

This model meets all requirements for a fatigue testing machine that will subject parts up to 10 pounds in weight to vibrations produced horizontally in simple harmonic motion. It has a range from 10 to 55 cycles per second (600 to 3,300 vibrations per minute) which are increased and decreased automatically at a uniform rate.

Write for this free bulletin.

Aldrich Hydraulic Handbook

This 60-page illustrated Aldrich Bulletin 50 was prepared for engineers and the many others in industry who are concerned with pumps and hydraulic equipment. It contains complete and authoritative hydraulic information and tables, under the following headings—Water Head Equivalents, Pump Plunger Loads, Hydraulic Formulae, Plunger Displacement, Pressure Equivalents, Capacity of Shafts, Electrical Data, Pump Discharge Diagrams, Accumulator Volumes, Friction Losses in fittings and pipes, Capacities of Pumps and Cylinders, Barometric Pressures, Pipe Data, etc. The second section of the handbook is devoted to Aldrich manufacturing facilities and the third is a condensed catalog of Aldrich pumps and hydraulic equipment. Many high pressure triplex and quintuplex pumps, for usual and unusual services in the marine, power, petroleum and other industrial fields are illustrated and described. Issued by The Aldrich Pump Co., Allentown, Penna.

New Boiler Meter Publication

Cochrane Corp., Philadelphia, has just issued a publication (No. 4071) on the new Cochrane Boiler Ratio Meter, announced last month. Introductory pages describe methods of checking combustion efficiency in boiler plants. Then follow the requirements for an ideal boiler meter, and the detailed description of the Cochrane Boiler Ratio Meter which it is claimed completely meet these ideal requirements. Installation details are also given.

V-Belts

Each of the various V-belts, sheaves and drives in what Allis-Chalmers describes as the widest and most accurately calibrated line of V-belt drive equipment ever developed is described in a new quick-picture bulletin just released by the company which invented the multiple V-belt drive.

Five special kinds of Allis-Chalmers Texrope V-belts—each designed for a specific type of protection—are reviewed. The Heat-Resisting Super-7 is a standard Texrope belt made of Buna-S which can operate easily at 180 degrees Fahrenheit ambient temperatures. Oil-Resisting Super-7 is a regular Texrope Buna-S belt core protected by a Neoprene rubber synthetic covering. The Oil-Proof Super-7 belt is made of solid Neoprene, designed to withstand heavy-duty oil conditions. To ground electric charges, Static-Resisting Super-7 conducts the charges through its cover section to the motor or machine. The Super-7-Steel belt, the newest, is built particularly to withstand high speeds with considerable less stretch than conventional-type belts.

The new type Allis-Chalmers Magic-Grip Sheave and the four speed changing methods used in Allis-Chalmers sheaves are also described in the new bulletin. Available from Allis-Chalmers, Milwaukee 1, Wisconsin, it is bulletin B6331.

Safety Valves and Safety Relief Valves

Manning, Maxwell & Moore, Inc., announce their new Consolidated Safety Valve and Safety Relief Valve catalog that has just come from the press. It is the most complete and detailed valve catalog that they have ever issued and contains all information needed by the buyer and engineer using these products. It contains complete capacity tables, sizing charts and a great deal of engineering data that will be welcomed by the valve users.

Cast Resin Plastics

Bakelite Corp., 300 Madison Ave., New York 17, N. Y. have just published 2 technical data booklets on "Bakelite Cast Resin Plastics." It is designed to give specific information regarding forms and shapes in which "Bakelite" cast resins are produced, their types and properties of each type. The second section of this booklet is devoted to methods of machining and finishing and articles produced from cast phenolic resins.

CORROSION

Causes Expensive Replacements

Here is a cross section of a severely corroded water cooled connecting rod of a large gas engine. This corrosion can be controlled with our Chrom Glucosates.

This is but one of the many sub-aqueous corrosion problems that are solved by the Haering Technical Staff.

Let a Haering field engineer survey your corrosion problems and submit recommendations without any obligation on your part.

Write for "Scale and Corrosion Control in Aqueous Systems."

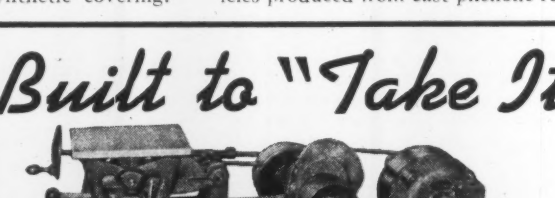
We Read Water

D. W. HAERING & CO., Inc.

GENERAL OFFICES:

205 West Wacker Drive, Chicago 6, Illinois

Built to "Take It"



THE new Model 10VA will subject parts or assemblies 10 lbs. in weight to a "shakedown" test that simulates the vibration conditions actually encountered in service. Tested for 50% overload. Vertical table movement. Features include:

New ALL AMERICAN VIBRATION FATIGUE TESTING MACHINE VASTLY Improved

- Timken Bearings.
- "V"-frame provides 4-point support for table—relieves vibration mechanism of stresses.
- Automatic cycling—acceleration changed from a frequency of 10 cycles per second to 55 c. p. s. and back to 10 c. p. s., continuously and uniformly. Complete cycle takes one minute. Send for Bulletin 210.
- Cycling may also be controlled manually.

ALL AMERICAN

Tool & Manufacturing Co.

1014 Fullerton Ave., Chicago (14)

• Keep Informed . . .

Announcements in this section are supplied by current advertisers in MECHANICAL ENGINEERING and A.S.M.E. MECHANICAL CATALOG. This section is restricted to these advertisers.

• *NEW EQUIPMENT*
• *BUSINESS CHANGES*
• *LATEST CATALOGS*

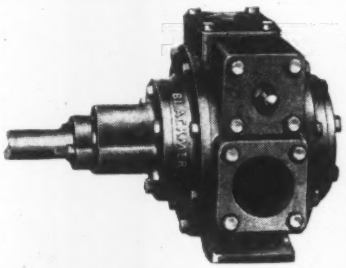
Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

New Blackmer 50-90 Gallon Truck Pumps

Two new truck pumps, in capacities of 50 and 90 GPM have recently been put into production at the Blackmer plant at Grand Rapids, Michigan, according to information released by Mr. J. B. Trotman, General Sales Manager of the Company.

While these new pumps differ in appearance and in certain details of construction from the present model, the bucket design swinging vane principle of operation that characterizes all Blackmer Pumps is used. The outstanding construction feature appears to be the double anti-friction bearings—one on either side of the rotor—this bearing construction should virtually eliminate shaft "whip" and distortion. The action of the buckets (swinging vanes) prevents loss of capacity during the life of the buckets which may easily be replaced when worn.



These new Blackmer truck pumps are compact and light in weight, are designed for standard power take off drive, and will deliver their rated capacity at 460 RPM. A Blackmer designed relief valve is built into the pump casing and will bypass the entire capacity of the pump without end thrust on the working parts.

Suction and discharge connections will be furnished for either 1½" or 2" iron pipe and if desired the Blackmer Ezy-Kleen "T" type strainer can be mounted at the suction of the pump or at a convenient point in the suction line, remote from the pump.

Mr. Trotman states that reasonably prompt delivery can be made on either of the two units.

Now, Accurate Reflex Torquing —faster than thought!

The P. A. Sturtevant Co., Addison, Illinois, announces the "Sturtevant Sensory" Torque Wrench which they report to be the culmination of seven years of extensive research—a wrench that in use is faster than thought, still a true permanently accurate Sturtevant Torque Wrench that will stand all ordinary shop abuse and yet remain dead accurate.

The Sensory model closely resembles the familiar "Sturtevant" Torque Wrench in appearance. Here is the difference—whereas the Sturtevant Torque Wrench depended solely on visual reading to determine the applied torque, the new Sturtevant "Sensory" model embodies two other features—"sound" and "feel."

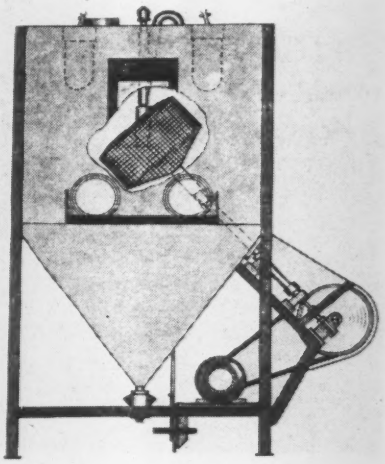
These Sensory features work as follows: A trigger finger is provided which can be set at any desired signalling point. As torque is applied with the wrench, and at the exact instant the "set" torque is reached, the sensory action (1) Sounds a loud and distinct click and (2) imparts a definite strong impulse to the hand. Thus, through *three* senses, sight, sound *and* feeling, the operator automatically releases (by reflex action) his pull on the wrench (even before the conscious mind reports it) making torque both fast and dead accurate. Here, through three channels instead of just one, the operator is conscious that the release point is reached, in spite of himself.

Several of these Sensory models were tested on an engine builder's production line. Periodic checks proved that after 79 days, Sturtevant Sensory models were still dead accurate and never required resetting.

A bulletin has been prepared and is available for distribution.

A 10 Minute Job in 10 Seconds

Makers of goods in all metals, plastics, glass, bakelite and other materials where the articles come in a wide range of sizes will be interested in a new type of sandblast now on the market.



This is a combination of the sandblast cabinet with stationary nozzle and the rotating basket or tumbling barrel type. The latter is fitted inside the cabinet in such a way as to make it available for sandblasting quantities of small articles such as nuts, screws and small gadgets of all types. The rotating basket is filled and the machine sandblasts the articles automatically as they are tumbled over and over.

The basket may be removed from the cabinet, when the larger available space inside may be utilized in sandblasting pieces of work of larger dimensions.

The basket is motor driven at the proper speed to make the sandblasting spray fully effective. The sand is fed through the nozzle over and over again from the sand reservoir at the bottom of the cabinet.

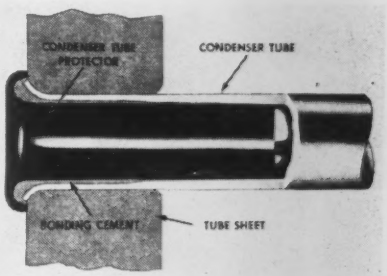
The sandblasting cleans the surface of metals of rust, scale or other imperfections in preparation for electro-plating, enameling, painting, etc. Castings which have been sandblasted clean of scale and burnt casting sand can be more speedily machined. Lathe tools will hold their cutting edges longer when castings are thus free of scale and burnt sand.

The sandblast also produces mat or satin finish effects, and stenciling of designs or lettering are quickly, accurately, and very distinctly produced. Plate and enamel will be firmer and more lasting on a sandblasted base.

Any speed of production required in this work may be easily approximated, and Lieman Bros., Inc. of 118-76 Christie St., Newark 5, N. J., will be glad to offer suggestions on receipt of full particulars.

John Crane Condenser Tube Protectors

Protection of condenser tube inlet ends against the destructive effects of air erosion and sand abrasion can now be obtained by using "John Crane" Condenser Tube Protectors.



These Tube Protectors are molded of a special wear-resistant, hard Bakelite material, unaffected by temperatures to 275°F. and resistant to air impingement and contaminated salt or fresh condenser circulating water. They fit inside the inlet end of the tubes as illustrated, are securely cemented in place and provide a bell-mouth Venturi entrance for the circulating water.

Service tests show that these Tube Protectors prolong tube life, saving essential materials and preventing "outages" at critical moments, so that they repay their initial cost many times over. They are available for all marine and stationary power plant condensers to fit tubes of the following sizes: ⅝", 16 and 18 gauge; ¾", 16 and 18 gauge; ⅞ and 1", 18 gauge.

"John Crane" Condenser Tube Protectors are a product of Crane Packing Co., 1814 Cuyler Ave., Chicago 13, Ill. An illustrated bulletin giving full details is available on request.

New Gage Point Punch

Philadelphia—The Baldwin Locomotive Works has just begun marketing of a gage point punch which is double-acting and on which impact force is adjustable for different materials. It is offered to the metals field for four reasons: (1) it marks four uniform centers on specimen with one push of the handle; (2) it automatically centers either round or flat specimens; (3) the impact force is applied manually by an adjustable

Continued on page 33

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue • New York City

MOLY

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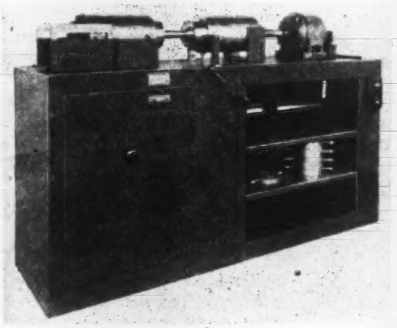
detent which eliminates the use of a hammer; (4) impact and size of punch marks is adjustable to suit soft and hard specimens.

The upper punch holder, guided in a heavy frame, is attached to the impact-adjustable handle. The entire upper punch point assembly is spring supported to keep the gap between punch points open for largest specimen. When specimen is placed on support, the upper handle is pushed down until all punch points rest on specimen. A continued push downward on handle brings to a pre-adjusted compression a second spring within the tubular knurled handle, releasing potential energy to produce impact on specimen.

New Oversize Rotating Beam Fatigue Machine



Philadelphia—The Baldwin Locomotive Works has produced for industry a new oversize rotating beam fatigue machine, designed to help "see around corners" in testing materials, based on published reports of studies which indicate that specimens of one inch minimum diameter eliminate "size effect" in fatigue.

The machine is a product of Baldwin's Southwark Division.

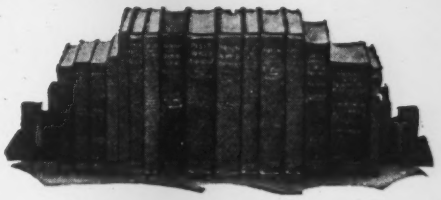
The new model SF-10 R Rotating Beam Fatigue Testing Machine has a testing capacity from 0 to 10,000 inch-pounds, adjustable by units of five-inch-pounds (bending moment) by position of weight on beam. Specimen length is adjustable from three and one-half to nine and one-half inches.

Carrier Unit Heaters in the Arctic

Navy personnel quartered in "Quonset huts" on lonely Arctic combat stations are now more comfortable through the installation of unit heaters developed specially by the Carrier Corp. These heaters which are enclosed in compartments adjoining the huts, blow warmed air into the interior of the huts contributing to more comfortable living conditions. Heating for the units is supplied with two 50,000 Btu space heaters.

Because of extreme weather conditions encountered in shipment, the heating units receive special packaging treatment before leaving the Carrier plant. Even if they are submerged in water while being unloaded from ship to shore, they are protected so as to reach their destination undamaged and are in condition for efficient operation. All of the parts of the unit are triple wrapped. Sealed inside heavy greaseproof, non-oxidized containers, they are fitted snugly in a wooden box lined with a waterproof paper. When all of the items are in place, a tar-base adhesive seals the lining like an envelope. The sealing plus the wrappings of the parts keeps out dust, and rain, snow and salt spray. When the top panel is screwed in place the box is bound with steel strips and is ready for shipment. *Continued on page 34*

WILEY BOOKS IN MECHANICAL ENGINEERING



Post-war plans in your field are being made right now. To become thoroughly familiar with the latest developments in your specialty you will need new, authoritative books such as those listed below. Be ready for new demands. Make your selections now and order today by means of the coupon below.

CENTRIFUGAL PUMPS AND BLOWERS

By Austin H. Church

308 Pages *$4.50*

Supplies basic design theory, construction and application data on centrifugal pumps and blowers from the *American* viewpoint. Presents essential time-tested material and methods explaining standard practice; plus basic information to enable you to understand new theories as they develop.

THERMODYNAMIC CHARTS—2nd Edition

By Frank O. Ellenwood and Charles O. Mackey

46 Pages *$2.75*

Many new conveniences are in this new second edition of the well-known "Vapor Charts" for Steam, Water, Ammonia, Freon-12, and Mixtures of Air and Water Vapor. Also special tables for Turbine Calculations.

CONVEYORS and RELATED EQUIPMENT

By W. G. Hudson

394 Pages *$5.00*

A comprehensive book on applications and limitations of material-handling, methods of storage, layout, proper erection, adjustment, performance, maintenance, and installation costs of present-day conveyors and related equipment.

MATERIALS and PROCESSES

Edited by J. F. Young

628 Pages *$5.00*

Offers a broad background for the design engineer. Tells how to choose the right material for designing, and how to design the product so that it is proportioned with respect to the material to be used, and detailed to accommodate the method of processing.

PLASTIC WORKING of METALS and NON-METALLIC MATERIALS in PRESSES—3rd Edition

By E. V. Crane

540 Pages *$5.00*

A handbook of the mass methods of press-working modern materials. The book tells how and why plastics move and are moved. For use in planning operations, dies and molds, and in making them function.

CARE AND USE OF HAND TOOLS

By R. R. Toliver; Edited by W. C. Lewis

95 Pages *Probable Price $1.25*

How to handle and care for tools so that they last longer and give better service. Marked by very simple explanations and large, clear illustrations.

MODERN TURBINES

By L. E. Newman, A. Keller, J. M. Lyons and L. B. Wales

180 Pages *$2.50*

Contains data on modern turbines, obtainable from no other source. Power-plant operators, mechanical and electrical engineers will find invaluable this practical discussion on the selection and characteristics of turbines.

HOW TO OPERATE A LATHE

By J. T. Shuman and L. H. Bardo

161 Pages *$1.75*

A guide for the training of machine shop operators. Presents factual material in a clear, concise and practical way, by means of questions and answers.

CONTROL OF ELECTRIC MOTORS—2nd Edition

By Paisley B. Harwood

528 Pages *$5.00*

Crammed with practical, up-to-date, original data on the design, construction, installation and operating characteristics of electric motors and control devices. New chapters cover synchronous, single-phase, and variable-voltage motor control.

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By Harold F. Dodge and Harry G. Romig

106 Pages *$1.50*

For quality control—factors in setting up inspection plans; double sampling, the AOQL concept, mathematical background for the sampling inspection tables; shop procedures for applying the tables.

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By Harry H. Judson and James M. Brown

Approx. 228 Pages *Probable Price $2.50*

Fundamentals on plant operation required to bring about accident prevention: use of modern tested methods for improvement of work procedures, improvement of plant and equipment, safety groups and related activities.

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NEW SMALL CAPACITY BLACKMER ROTARY PUMP

2/3 to 3 1/2 GPM Pressures to 100 psi.

FEATURES

1. "Bucket Design." Special vanes make this pump self-adjusting for wear.
2. Compact—light weight. The pump fits in small mounting space.
3. Built-in relief valve is optional.
4. Furnished complete with base and prime mover or for "V" belt drive.
5. Also furnished as pump only with special mounting brackets to meet customer's specifications.

For all applications requiring small capacity, non-pulsating flow, and flexibility in mounting, this new pump adds the advantages of "*Bucket Design*" which compensates for wear, automatically.

PROMPT DELIVERY ON UNITS FOR EXPERIMENTAL USE.

Write for Bulletin NEW 2 with complete specifications on this new unit.

BLACKMER PUMP COMPANY

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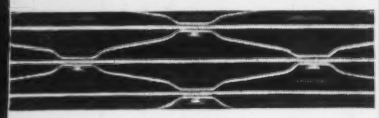
FLOORING AND STAIR TREADS

"A Fitting Grating for Every Purpose"



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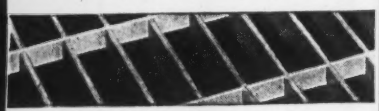

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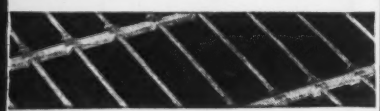

Welded

Catalog for the asking.

IRVING SUBWAY GRATING CO., INC.

ESTABLISHED 1902

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LONG ISLAND CITY 1, NEW YORK

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EMERYVILLE 8, CALIFORNIA

• Keep Informed

Low-Cost Ground Clamp for Welding Announced by Lincoln Electric

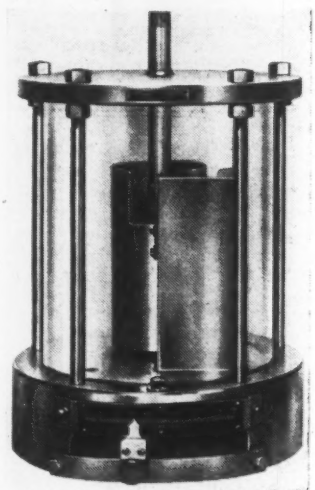
A new ground clamp for welders priced at only $1.50 has just been announced by The Lincoln Electric Co., Cleveland, Ohio, world's largest producer of arc welding equipment.

Besides its low cost, the clamp is designed so that each jaw connects independently to the ground cable. Thus, if one jaw is prevented from making a good electrical contact, due to any reason such as heavy scale, paint, etc, the other jaw will carry the current.

The ground clamp has a heavy-duty processed steel frame with durable copper conductors and contacts. The unit weighs only $1\frac{1}{2}$ pounds, has a maximum jaw spread of $2\frac{1}{2}$ inches and a rating of 300 amperes.

New Flow Splitting Device

A new flow splitter, called the Micro-Rotaweir, is available to accurately divide a liquid flow into two streams. The proportions of the flow division may be varied at will by adjusting an outside lever and pointer to the percentage desired, as indicated by an external scale.



Referring to the photograph, the operation of the Micro-Rotaweir is as follows: The inlet pipe comes in from the top and discharges the liquid into a receiving chamber which has a rectangular weir as an overflow. A vertical knife edge is set against the external edge of the weir, thus dividing the stream into two parts as it flows over the lip of the weir. One of the streams flows into a closed compartment with bottom outlet; the other stream spills into the area surrounding the receiving chamber and discharges also from the bottom. The receiving chamber is connected through a stuffing box at the bottom to an external lever by means of which the weir may be rotated to any position with respect to the flow-dividing knife edge.

The Micro-weir may be obtained with fittings in all metals. The shell may be either metal or Pyrex glass as in the illustra-

Now ACCURATE *REFLEX* TORQUING

Faster than thought . . . WITH THIS NEW WRENCH

accurate torquing becomes fast and automatic. When the exact "set" torque is reached, the SENSORY Mechanism sends three simultaneous nerve impulses to the operator's muscular control center, instantly releasing the tension by reflex action. Recorded through three channels—*sight, sound* and *feeling*—all three at once—or by any one of them individually, *automatic reflex torquing* is obtainable under every working condition, in spite of lack of visibility, factory din, physical handicaps (deaf, blind or maimed), or degree of inattentiveness.

This new Sensory feature is built into standard STURTEVANT *Permanently Accurate* Torque Wrenches—the indestructible torque measuring wrench universally used for production, inspection and wherever torque must be accurately gauged. Controlled by reflex-action it speeds up production while maintaining accuracy of torquing far beyond that possible with any other fast-operating production wrench.

On a field test in large engine builders production line first test wrench still dead accurate after 379,447 deflections—no repairs, no resettings, no adjustments *and still operating.*

Write for Bulletin SW 17

P. A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

BUY MORE WAR BONDS

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tion. For high melting fluids the metal shell may be lagged and steam-heating coils placed inside the Rotaweir.

The Micro-Rotaweir will handle flows from 30 G.P.H. to 900 G.P.H. Sizes up to 15,000 G.P.H. are also contemplated.

The Micro-Rotaweir has been used for the following operations:

(a) Proportioning product to reflux on small pilot plant stills.

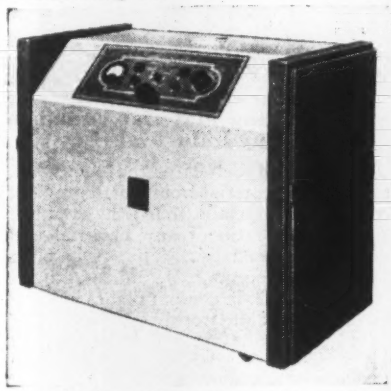
(b) Dividing liquid flow to twin absorbing units, cooling towers or other reactance vessels operating in parallel.

(c) Flow splitting for liquid blending and flows to storage tanks.

For complete information write to Fischer & Porter Co., 97 County Line Road, Hatboro, Pa.

High Frequency Generators Announced

For both induction and dielectric heating loads, a complete line of high frequency generators with ratings of 1, 2, 5, 10 and 20 kw in line with NEMA standards is announced by Westinghouse Electric & Manufacturing Co.



Completely self-contained, the units require only electrical connection to a 60-cycle power supply and have no external cooling or other auxiliaries. Units of 50 to 200 kw capacity can be supplied in addition to standard one to 20-kw ratings. The primary voltage is 220 or 440 volts, single phase for ratings of 5 kw or lower and 3 phase for 10 kw and higher. Housed in the single cabinet are the oscillator, power supply, blower, and necessary switchgear. The high frequency section is completely shielded to minimize the possibility of interference with nearby communication circuits. An automatic timing control permits load cycle adjustment to a predetermined time, which can be automatically repeated. Terminals are provided for remote control.

Air-cooled tubes are used in the standardized generators. Their use eliminates bulky water-cooling equipment and allows complete portability of the 2-, 5-, and 10-kw units and increased portability of the 20-kw unit. The air blower for cooling the tubes provides a circulation of air throughout the entire equipment, insuring a greater factor of safety and permitting a reduction in size.

The high-frequency oscillating circuit varies with the kilowatt rating and frequency needed. The circuits selected entail the least number of controls, are simple to adjust and operate and have the greatest overall efficiency. For capacities through 10-kw the type of circuit permits frequency shift as the characteristics of the load change during the heating cycle in such a manner that the load on the tube anode tends to approach unity power factor. In the two-, five- and ten-kilowatt generators, the load can be

Continued on page 36

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Design, construction and installation of complete plants and projects

Mechanical, Heavy Industries, Shipbuilding, Hydro-Electric Developments, Power Plants, Chemical and Refining Plants, Process Industries, Metallurgical Developments and Processes, Explosives, Plastics, Water Supply and Treatment, Sewage and Industrial Wastes Treatment.

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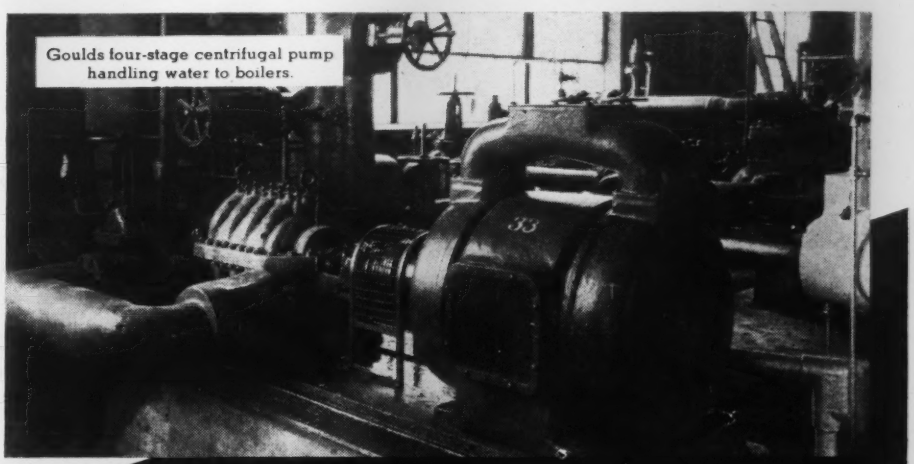


Goulds four-stage centrifugal pump handling water to boilers.

Goulds

the PUMP FOR the JOB

to answer every power plant pumping problem

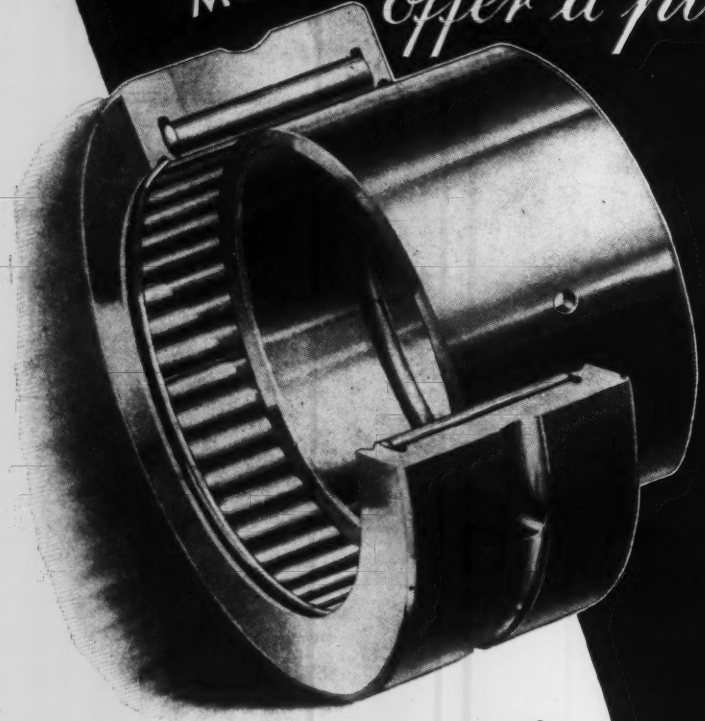
Power plants that during these strenuous days are called on for capacity operations around the clock are not surprised at the way Goulds Pumps are taking this continuous overload duty in their stride. During all of the 96 years of Goulds history, power plants have been depending upon Goulds pumps for every liquid handling operation.

When planning on new facilities or replacements look to Goulds. From Goulds complete line you can select *the* pump for *the* job—whether it is boiler feeding, hot and cold water circulating, sump, cooling tower or any other duty.

Goulds PUMPS INC.

SENECA FALLS, N. Y.

McGILL SOLIDEND MULTIROL BEARINGS offer a "plus"



You get more than "a bearing" when specifying McGILL "Solidend" MULTIROL. You get greater load capacity, provision for incidental thrust, bearing rigidity, high carbon chrome steel, and the elimination of end-washers and loose retaining rings. Thus, you are assured of a lower initial, operating and maintenance cost and at the same time an improved bearing performance.

For complete details and specifications of McGILL "Solidend" MULTIROL Bearings, send for bulletin SM-42.

BEARING DIVISION — 1100 N. Lafayette St.

McGILL MANUFACTURING COMPANY, INC.
VALPARAISO - INDIANA

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coupled to the work without the use of an external impedance-matching network when the work and generator are close together. A separate network is available for greater distances to the work and for use with the 20-kw unit.

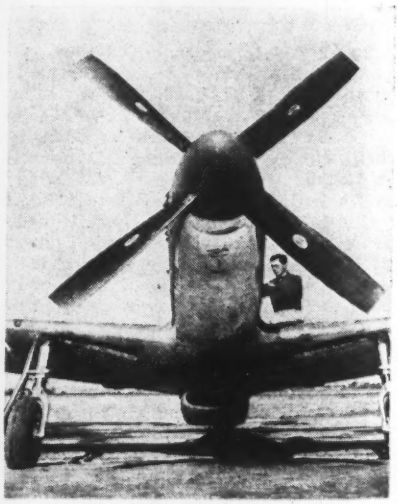
Generators are available for frequencies of 450 kc, 5, 15 and 30 mc for ratings through 10 kw and 450 kc, 2 and 10 mc for 20 kw and higher. This range of frequencies provides for adequate handling of all types of induction and dielectric problems.

Single-phase, full-wave mercury-vapor rectifiers provide the anode current for generators under 10 kilowatts. For capacities of 10 kilowatts and larger, a three-phase, full-wave rectifier, utilizing six mercury-vapor tubes is used, giving even distribution of power demand, reducing conductor size and providing better voltage regulation. Time-delay switches are standard on all rectifiers. Step starters are used in the 20-kw capacity unit and those larger to safeguard the rectifier tubes from high transient voltages, while starting and reduce the danger of flashovers on the work circuit arising from starting surges.

Further information on the new high frequency generators may be secured from Westinghouse Electric Manufacturing Co., East Pittsburgh, Pa.

Propeller Fairing Material Found to Have Many Industrial Uses

The makers of Cell-Tite, the ebony-like, cellular rubber material from which propeller fairings are made, claim that it has the best strength-weight ratio of any material ever produced commercially. That this claim may be justified seems to be indicated by its performance on U. S. combat planes in battle zones throughout the world.



By the addition of fairings to propellers, more air is churned back onto the engine to obtain a considerable decrease in engine temperature. The resulting increase in engine efficiency may be directed to higher speed, rate of climb or ceiling, increased safety factor, heavier "pay load" (more bombs or fuel) longer range or any of several other desirable characteristics. Fairings also increase the area of effectiveness of propeller blades which means better plane performance at the same engine speed.

Designers and engineers of North American Aviation, Inc., manufacturers of the P-51 Mustang illustrated, feel that the aerodynamic aid resulting from the use of the propeller fairings of correct design and proper

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material, represents one of the most important recent developments in airplane construction. The Mustang has been proclaimed the fastest airplane in existence, and set a record of 6 hours 31½ minutes between Los Angeles and New York last May 12.

Made in various weights from 8 to 20 pounds per cubic foot, depending on the use to which it is to be put, Cell-Tite is filling many industrial needs. The Cell-Tite fairings affixed to Hamilton Standard Propellers (see illustration) weigh only 4 to 6 pounds.

Cell-Tite has other attributes than strength, hardness and light weight to merit its wide use in industry. It has more buoyancy and lower water absorption than cork; it has excellent thermal, electrical and sound insulation qualities. Manufactured by The Sponge Rubber Products Co., 129 Housatonic Ave., Derby, Conn., Cell-Tite can be molded to almost any shape or form. Practically impervious to water and weather and with high resistance to chemical attack, it has first rate aging properties. It can be sawed, drilled, planed and otherwise worked much the same as wood.

Simplifies Bore Concentricity Checks

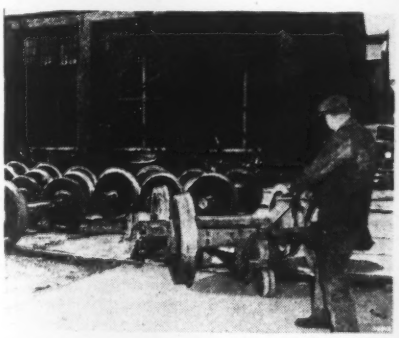
A fixture for testing concentricity of bores, devised by M. S. Anthony, a general foreman at General Electric's Pittsfield Works, is simpler, more accurate, and 100 per cent faster than checking them on a lathe. The fixture consists essentially of a machined cast-iron block with a 1½-in hole at one end to accommodate bushing to take various diameter adapters required for the bores. A ⅝-in. reamed hole at the other end of the block supports a post on which an adjustable indicator arm is clamped.

A hardened ground and lapped bushing pressed into the 1½-in. hole provides a bearing support for the adapters. The bushing and adapters have a ground 30-degree seat to simplify alignment. Diameter of the adapters is held to within 0.0001 in. of the lower limit of their respective bores. To use the fixture, the operator either fits the part over the adapter, or the adapter into the part. Concentricity of the bore is checked easily by positioning the dial indicator and rotating the part.

The previous method of checking the part on a mandrel between lathe centers with the dial indicator held in the tool post was always complicated by the tailstock.

Unique Use of Hand-Lift Truck

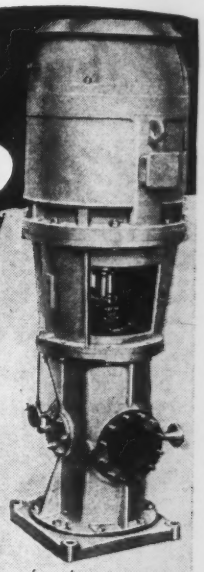
Railway maintenance shop men have developed another important use for the Load King which proves anew the amazing versatility of this Yale hand-lift truck—and the minds of men.



A car axle with wheels weighs better than a ton. Without a travelling crane or an electric low-lift truck it is ordinarily an awkward baby to handle.

Continued on page 38

Only ONE IMO



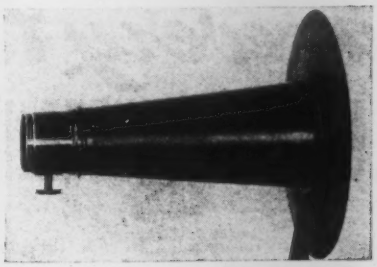
The De Laval-IMO Pump is of the rotary displacement class, but has:

- Only 3 working parts,
- No valves,
- No gears,
- No cams,
- Only one packing box (on the suction side),
- Perfect hydraulic balance,
- Perfect rotary balance,
- Freedom from pulsation,
- Suitability for direct connection to motors or turbines,
- Ability to pump any oil in any volume against any pressure.

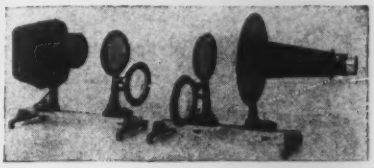
Ask for Publication 1-108.

IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton, New Jersey

The LENS *that assures* PRECISION



For either qualitative or quantitative photo-elastic analysis, perfection in the projection lens system is of major importance.



In our new model polariscope of 4¼" clear aperture, the parallel beam is collected by a rear element and condensed through a three component lens of the Cooke system. In the new larger unit (8¼" aperture) a four component lens of the Omnar system is used. *The image is sharp throughout the field, free of aberration, astigmatism, and distortion.*

Literature of new model polariscope now available

POLARIZING INSTRUMENT CO., Inc.
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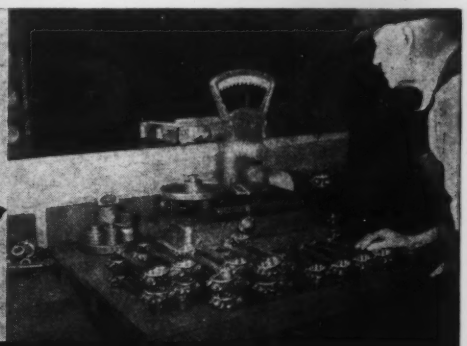
BALANCED RODS... another "PLUS FEATURE" built into all



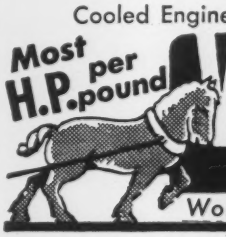
WISCONSIN *Air-Cooled* ENGINES

Every connecting rod, in every Wisconsin Air-Cooled Engine, is precision-balanced to eliminate all weight variations in excess of ¼-ounce per rod.

This is admittedly cutting it pretty fine for a rough-and-ready heavy-duty engine . . . but not *too fine* for these fine engines. Smooth operation, reduction of vibration to a negligible minimum, prevention of excessive wear . . . these are factors that can be controlled only by the most meticulous care and attention to such small details as this.

The *value* of this attention comes into play when a Wisconsin Air-Cooled Engine powers your equipment.

Most H.P. per pound



WISCONSIN MOTOR Corporation
MILWAUKEE 14, WISCONSIN, U. S. A.
World's Largest Builders of Heavy-Duty Air-Cooled Engines

You can see the Quality in every line of a LUNKENHEIMER VALVE

From handwheel to pipe threads a Lunkenheimer Valve reflects exceptional strength and ruggedness. Ample proportions and perfect balance of all parts are basic design features that give assurance of the good service and long life so characteristic of Lunkenheimer Valves.

Maintenance men have long since come to depend upon Lunkenheimer for the best in valve service . . . knowing they will get the highest degree of performance with the least amount of trouble and maintenance expense.

•

Lunkenheimer distributors are located in all industrial centers. Use the facilities of the one nearest you for service on your requirements.

ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
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NEW YORK 13 · CHICAGO 6
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EXPORT DEPT. 318-322 HUDSON ST., NEW YORK 13, N. Y.

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In one shop however, workmen have solved the problem for all time, at small cost. By placing 2″ x 8″ planks or other heavy timbers on the lifting platform of a Yale Load King it is thus built up until it is practically axle high. Next, it is elevated until the planks exert lifting pressure on the axle. At this point wood wedges are inserted, locking the axle (or axles—two may be carried) in position as shown in the photo.

The load is now secure—may be moved quickly and safely to any corner of the shop or yard.

Handling Drums a New Way

Certain types of industries, particularly those involving the handling of chemicals, gas and oil, paint and similar materials in metal drums or barrels, report unusual economy, speed and efficiency through the use of the Yale Telescopic Tilting Fork Truck equipped with a removable barrel handling device.

This ingenius addition has special short forks and a metal loop which is dropped over the barrel or drum by lever action after the forks have been slid underneath. This practical device enables the operator to pick up barrels and drums and transport them in and out of cars and storage without stepping off the truck. In effect, one man does the work of several, moving many containers in an hour's time with speed and safety. When job is completed, the barrel handler is removed, the regular forks are replaced and the truck resumes its routine materials handling functions—lifting and moving and high-stacking skid and pallet loads in and out of storage.

New Umbrella Type Assembly Bench Allows Complete Freedom in Spacing of Operators

A new umbrella type bench, supported by centrally located legs instead of the usual two outside legs placed at regular intervals along the conventional type bench, has recently been developed in the Voltage Regulator Division at General Electric's Schenectady Works. The use of the new benches has resulted in a 30 per cent improvement in the utilization of working space at assembly and testing benches inasmuch as operators may now be placed anywhere along the benches with no interference from those in-the-way legs.

The benches are 2 ft. 8 in. high, 22 inches wide, and are constructed entirely of metal with masonite coverings over the sheet steel tops. The legs, cut from 3-inch standard channel steel, are each welded to a 4 by 16 inch base and supported by a 4 by 10 inch

upright angle cut from 3/8-inch steel plates. Two holes are drilled in each base to accommodate floor bolts. The legs are welded to the table top and supported by means of two 1/4 by 1 1/4 by 8 inch iron straps.

The elimination of half the legs and stringers required for the old type benches, and the reduction in the width of the top, has reduced the cost considerably because only about half the metal is used. The labor cost, too, has been reduced since there is less welding, cutting, and bending to be done, and it is of a simpler nature. It is also much easier to keep the area around the benches clean with only half as many legs to contend with.

The 22-inch table top width may seem quite small but there is sufficient space for the necessary tools and equipment without crowding the working area. There is, however, no excess space for the accumulation of unnecessary boxes, lockers, defective parts, and other articles which decrease working efficiency, waste valuable space, and add to a general untidy appearance.

Utilization of Diesel Power in World War II Shows Significant Trend Towards This Type of Prime Mover

A remarkable increase in the use of diesel power to supply the nation's war demands was disclosed by Gordon Lefebvre, president of The Cooper-Bessemer Corp., who released some significant figures relative to the current use of these oil-burning engines.

The total diesel horsepower now being utilized by our Navy alone in the present war is probably well over 20,000,000 as compared to about 150,000 diesel horsepower used in the first World War, according to Lefebvre.

"The fact that more diesels have been installed for marine service alone during the past six years than were in existence in this country prior to 1938," said Lefebvre, "indicates the trend toward diesels as the most practical source of power for many applications."

A break-down of the survey made by company engineers showed that during World War I diesels were employed for some submarines and a few auxiliary-powered schooners, whereas World War II has seen the applications of this type engine expand to practically every kind of vessel in naval service.

In commenting on the rapid progress in diesel utilization during recent years, Lefebvre indicated that while the much larger scale of the present war has been a big influence, this fact alone has not been entirely responsible for today's broad dieselization program.

"The diesel engine has largely overcome the disadvantages which retarded general acceptance in the past," he said. "Added to its inherent operating economy, due to low-cost fuel and other factors, there has been an increasing recognition of the safety factors it makes possible over highly volatile gasoline or high-pressure steam. Furthermore, there have been many valuable technical advances in diesel engine design which have materially reduced unit weight and added to the efficiency of operation."

Progress in metallurgy, which has brought about vast improvements in engine design, has been so great, according to Lefebvre, that some marine diesel power plants have been produced which are as much as 30 per cent lighter in weight than an equivalent steam plant. Vital reductions in weight and space have also been brought about through improvements in supercharging. Certain

Continued on page 40

The performance records made by over 2,000,000 BRIGGS & STRATTON Engines testify to their perfection of design, their fine engineering, and to precision production.

Air-Cooled Power

4 CYCLE
BRIGGS & STRATTON
GASOLINE ENGINES

Manufacturers of all types of appliances, tools and equipment requiring dependable, compact power units are invited to investigate the performance record of Briggs & Stratton engines. The latest models are backed by the experience gained in twenty-five years of *continuous* production of AIR-COOLED Gasoline Engines. BRIGGS & STRATTON CORPORATION, Milwaukee 1, Wisconsin, U. S. A.

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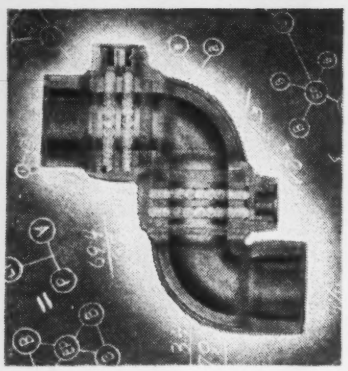

$$BB_2 + EP = \frac{LT}{P/V}$$

BB_2 = **Double rows of Ball Bearings** — For easy turning with minimum friction. They also maintain perfect alignment of moving parts.

EP = **Effective Pack-Off** — This self-adjusting unit permits the use of the same Swivel Joint for all services. Nothing to tighten or adjust.

LT = **Low Torque** — No excessive friction drag because turning takes place on ball bearings which hold moving members together. Tightness of Joint does not depend upon compressing packing element by means of bolted flanges, thereby causing joint to stick.

P/V= **Pressure or Vacuum** — Pre-determined pressure on Packing Ring prevents leaks due to pressure or vacuum. Packing automatically adjusts itself to either service.

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Ball Bearing SWIVEL JOINTS for ALL PURPOSES

BREA, CALIFORNIA

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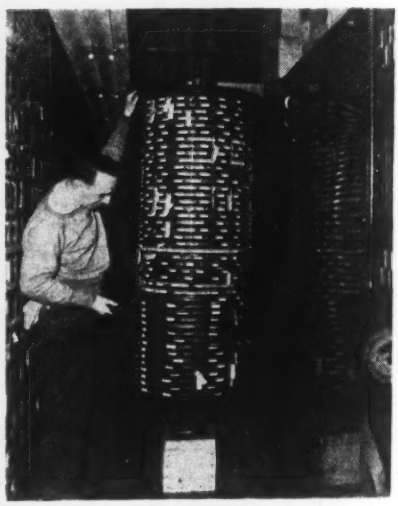
phases of these and other recent diesel developments have been the result of Cooper-Bessemer research and engineering.

"The strides that have already been made in diesel efficiency signify that during the years following the war, it is not inconceivable that all commercial airliners will be diesel-powered," Lefebvre said. "In this connection it is interesting to note that with the exception of aircraft, the United Nations' use of diesel power is much more diversified and far exceeds that of the Axis powers."

The Cooper-Bessemer Corp. is one of the oldest and foremost producers of internal combustion engines for marine and industrial use. The entire production of the firm's plant at Mount Vernon, Ohio, and Grove City, Pa., is allocated to the armed services and to critical commercial requirements.

Turntable Snap Gage Rack



This tier of circular wooden shelves mounted on a turntable now provides storage for 400 snap gages at General Electric's Fort Edward plant. Since the gages are issued and returned daily, the problem was to store them in an accessible position using a minimum of floor and wall space. C. S. Loughlin of the plant's Planning Department devised this tier with shelves spaced to accommodate the different thicknesses of the snap gages and with separators between the variously sized gages. The separators also act as spacers for the shelf above. When a gage is removed, a tag is attached to that space in the rack. The entire tier is mounted through the center on an iron pipe which rests on a ball bearing on the bottom and runs through a roller bearing on top. A pipe rail attached to the top and bottom shelves facilitates turning the rack.

Double Cylinder Rotary Air Pumps Reduce Strain

A two-cylinder pump combining the advantages of two separate single-cylinder pumps as to service while retaining the compact construction of the single pump is announced by Leiman Bros., Inc. of Newark, N. J.

This two-cylinder pump is of the rotary type and is used for air pressures up to about 50 lbs. per square inch and for vacuum up to about 28.7 inches mercury. While one cylinder may be used for pressure the other may be used for vacuum, or both may be used for pressure or for vacuum. One cylinder may pump into the other for the purpose of increasing the air pressure, or one may

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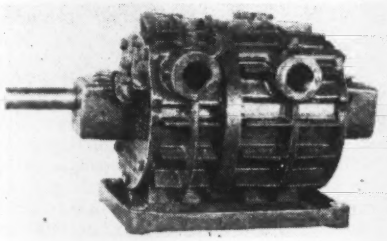
pump from the other to increase the vacuum as occasion may require. This results in cooler operating pumps than where single cylinders are used.



The unique method of finishing and fitting the interior working parts of these highly efficient double cylinder rotaries has produced a remarkably adaptable pump for uses formerly requiring separate pumps occupying considerable excess space, which is no longer required with these compact machines.

Made in several sizes, manufacturers of devices requiring air pressure or vacuum or both will find the answer to many of their problems in this latest production in the line of rotaries made by Leiman Bros., Inc. of 118–74 Christie St., Newark, N. J. Free information will be furnished by this firm on request.

The machines are remarkably smooth in operation, cool, quiet running, and above all very efficient in comparison with the old method utilizing separate, single-cylinder pumps.

Buffalo Pumps Receives Fourth Renewal of Army-Navy "E"

Buffalo Pumps, Inc., Buffalo, N. Y., subsidiary of Buffalo Forge Company, has just been notified of a fourth renewal of the Army-Navy "E" Award for excellence of production.

Buffalo Pumps, Inc., was one of the first manufacturers to receive the original Army-Navy "E" Award, and is also one of the first to get the fourth renewal, which is to be retained for a year, instead of the customary six month period.

Four Gold Stars for Edward Valve

The Maritime "M" pennant of The Edward Valve & Mfg. Co., Inc, East Chicago, Indiana, now flies four Gold Stars as the result of the recent award by the U. S. Maritime Commission of an additional Gold Star for continued production achievement. The award was announced by Rear Admiral Howard L. Vickery. The plant manufactures cast and forged steel valves.

Combustion Engineering Receives Three More Production Awards

Recent awards to plants of Combustion Engineering Co., include the Maritime Commission "M" pennant to the Heine Boiler Div., St. Louis; a fourth star for the "M" pennant awarded in 1942 to the company's Hedges-Walsh-Weidner Division, Chattanooga; and an Army-Navy "E" to the company's assembly plant at Savannah, Ga.

Westinghouse Plants Receive High Awards

Although, according to Navy records, less than two tenths of one per cent of the nation's war plants have thus far achieved the honor, two plants of the Westinghouse Electric & Mfg. Co. in Philadelphia, Pa., have been awarded a fourth renewal of the Army-Navy "E," Company officials announced recently. They are the Steam Division at nearby

Continued on page 42

"This is Where Nuts Shake Loose,"

*say over a thousand fleet operators in recent survey**

1. Universal Joints and drive shaft flanges	59.4%	7. Wheels	36.2%
2. Rear axle flanges	56.5	8. Backing Plate to Axles	23.0
3. Spring clips	54.3	9. Clutch and brake	13.7
4. Bumpers	49.5		
5. Body bolts	45.0		
6. Engine supports	39.0		

and 52 other parts of the truck assembly, as well as 24 places in supplementary equipment.

1,160 Fleet Supervisors put their finger on the LOOSE NUT MENACE!

Long life and high use are vital factors to fleet operators. To solve the loose nut menace, they call for an all-metal, one-piece nut—the nut that *can't shake loose.*

In the No. 1 danger spot named above, Boots Self-Locking Nuts held fast through 12 months testing of hard-driving wear and tear. With its built in steel lock, the all-metal Boots Nut grips tight. Can be used again and again. Unaffected by water, oil, chemicals.

The ALL-METAL LOCK is Built-in Here

*OPERATORS OF 110,000 MOTOR VEHICLES say that a vibration-proof nut like this would save tens of thousands of dollars in service costs.

BOOTS SELF-LOCKING NUTS "There's No Excuse for a Nut Shaking Loose"

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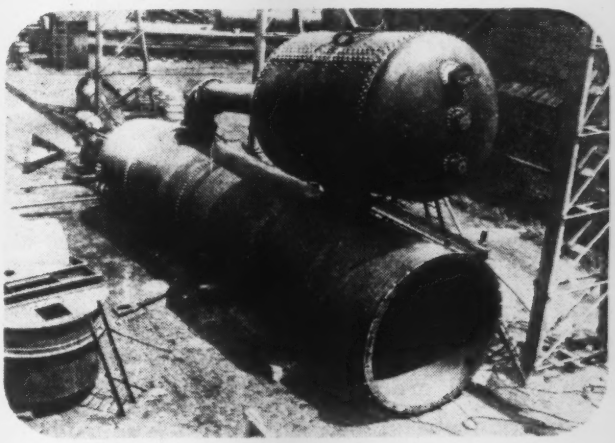

BUT IT'S *IN* THE PRODUCT

A blueprint is concerned only with design and specifications.

We concede the importance of good design and intelligent specification of materials, but Downingtown's ability does not stop there.

Our specialized knowledge of fabrication, proper methods of procedure, complete, modern plant facilities and wide experience in manufacturing are not blue-printed, but they do show up in the finished product.

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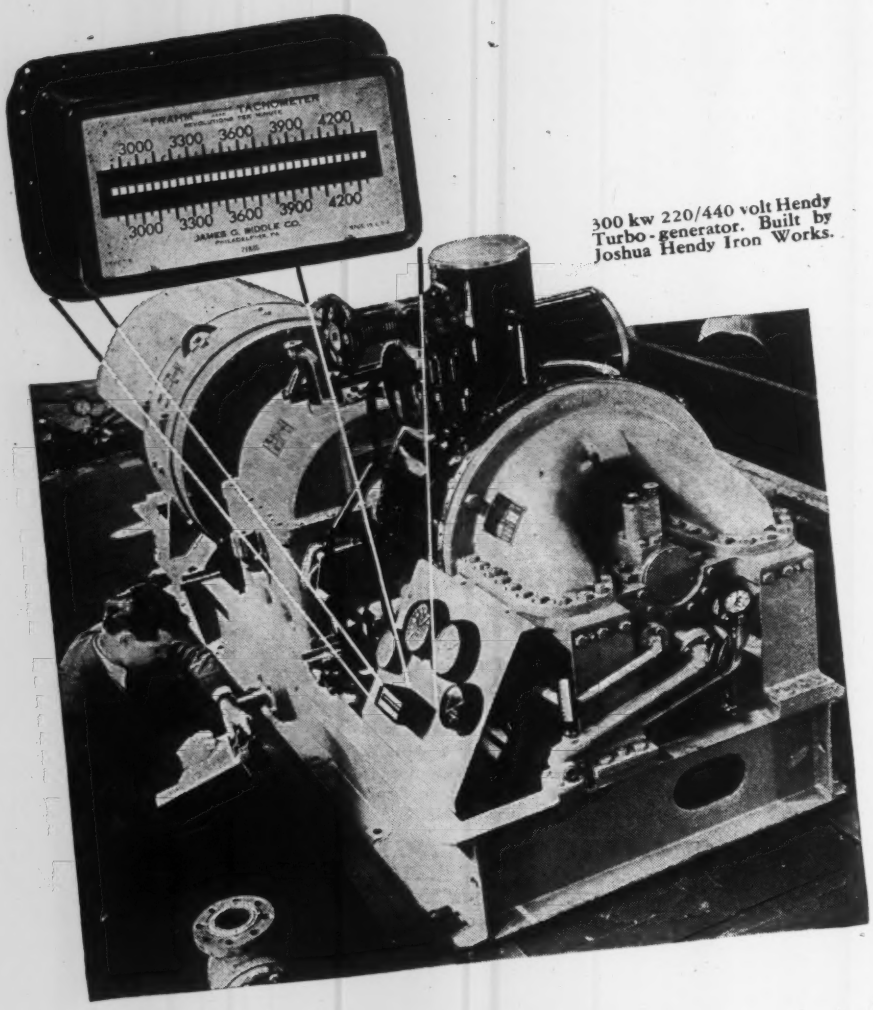
WELDED and RIVETED PRODUCTS

Our Engineering consultation is at your disposal. Downingtown Heat Transfer division has prepared a handbook which will be ready for free distribution on or about Sept. 15th. Send for a copy of this handy reference book, on your business letterhead, please.



300 kw 220/440 volt Hendy Turbo-generator. Built by Joshua Hendy Iron Works.

. . . making **"ASSURANCE DOUBLY SURE"**

***with the* "FRAHM" RESONANT-REED TACHOMETER**

In the modern turbo-generator, uniformity of speed must be maintained over the entire range of no-load to overload conditions.

The Hendy unit shown above has a carefully designed and precisely built governor to assure uniform speed under widely varying load conditions. As a double check, however, Frahm Resonant Reed Tachometers are used on Hendy and other well-known turbo-generators, both large and small, to provide the operator with constant proof of turbine speed. Manufacturers select Frahm instruments for this service because of their simplicity of construction, ease of installation and freedom from maintenance.

Frahm Tachometers are built in both stationary and portable types for use on many kinds of machines having rotating parts. Various ranges are available from 900 to 60,000 r.p.m.

For a complete description of Frahm Tachometers together with list of types and ranges commonly supplied, write for Bulletin 1590-M. The instrument shown above is listed in Bulletin 1740-M.

JAMES G. BIDDLE CO. 1211-13 ARCH ST. PHILADELPHIA 7, PA.

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Lester, which builds turbines to drive warships, and the 30th Street Manufacturing and Repair plant. In addition, the new Merchant Marine Division plant at Lester, which builds turbines for Victory ships, has just received word of the second star added to its "M" pennant, awarded by the Maritime Commission.

One hundred thousand plants in the country are eligible to try for "E" awards, but only three thousand (three per cent) of them have won E's and only 176 a fourth renewal.

Admiral C. C. Bloch, chairman of the Navy Board of Production Awards, said that the renewals were "due to the untiring efforts of the Westinghouse men and women" and that "every one of them is to be congratulated heartily for a splendid production record."

• BUSINESS CHANGES

Miller Now Norma-Hoffmann Eastern Sales Manager

Norma-Hoffmann Bearings Corp., Stamford, Conn., announces the following appointments: Robert L. Miller, assistant sales manager, to be Eastern Sales Manager; Carl W. Hedler, assistant sales manager, to be Western Sales Manager, continuing his former duties in charge of distributor sales. Mr. Miller and Mr. Hedler, both of whom have been with the Norma-Hoffmann organization for many years, will report directly to Frederick W. Mesinger, recently elected Vice-President in Charge of Sales.

Economy Pumps Appoints Quimby

L. G. L. Thomas, General Manager of Economy Pumps, Inc., Hamilton, Ohio, announces the election of E. E. Quimby to the position of commercial Vice-President, specializing in sales transactions for the very large projects which are too involved for a resale agency, such as flood control work, etc.

Mr. Quimby is widely known as senior partner of Quimby-Ryan, 1 East 42nd Street, New York, N. Y. His firm has represented Economy Pumps since 1928 and he will continue his active connection with Quimby-Ryan in addition to his new relation with Economy. Mr. Quimby has a background of 25 years' experience in the pump industry. For several years he was Sales Manager for the Quimby Pump Co., New York, N. Y., and later was Vice-President and General Manager of the Sundh Electric Co. of Newark, N. J. When the Sundh Electric Co. was sold to the Clark Controller Co., Mr. Quimby joined with Mr. E. T. Ryan in forming the Quimby-Ryan Co.

Mr. Quimby's engineering schooling was received at the Drexel Institute, Philadelphia.

In making the above announcement, Mr. Thomas mentions that this is one more step in the preparation and organization of a broad postwar engineering and sales program.

K. R. Van Tassel Named Manager G-E Industrial Control Division

Effective July 7, K. R. Van Tassel was named manager of the Industrial Control Division of General Electric's Industrial Divisions, it has been announced by J. E. N. Hume, commercial Vice-President. Mr. Van Tassel succeeds George R. Prout, recently appointed manager of the Company's Air Conditioning and Refrigeration Division of the Appliance and Merchandise Department.

Mr. Van Tassel, a native of Geneva, N. Y., attended Hobart College and was graduated

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from the Massachusetts Institute of Technology in 1925. He joined the General Electric Co. as a student engineer the same year. In 1926, he was transferred to the Transformer Engineering Department, Pittsfield, Mass., where he remained until 1928 when he entered the Single-phase Motor Department there. Later he was made designing engineer of that department.

In 1932, he was transferred to the Fractional-horsepower Motor Engineering Department, Fort Wayne, Ind., in 1936 becoming its commercial engineer and in 1938 staff assistant to the manager of the Fort Wayne Works. In June, 1940, Mr. Van Tassel was made manager of sales of Lynn Motors, at General Electric's Lynn Works, where he remained until October, 1942, when he was named manager of sales of the Integral-horsepower Motor Section of the Motor Division, with headquarters at Schenectady.

Horan Appointed Sales Manager of Grinnell Superseal Tube Fittings

Thomas R. Horan of the Grinnell Co., Providence, R. I., has been appointed Sales Manager of the Superseal Tube Fittings Department. For two years Mr. Horan has been Grinnell's representative in Washington, prior to which time he was located at the Chicago branch office. He has been with the Grinnell Company for twenty-five years. Working out of Providence, Mr. Horan will direct the Superseal sales activities of Grinnell's fifteen branches.

Kennametal Opens District Offices in Kansas City and St. Louis

Kennametal Inc., of Latrobe, Pa., has opened offices at Kansas City and St. Louis, Missouri, both under the direction of R. B. Weeks, Manager at Chicago, Illinois, where the Company now has a warehouse to more effectively serve its customers in the midwest territory.

The Kansas City office is in charge of Representative Ralph H. Craig, who has had many years experience as plant foreman, and most recently as tool engineer with the Dodge Chicago Plant of Chrysler Motors.

The St. Louis Office is in charge of Representative Lyle H. Wade, whose experience embraces 14 years in machine shop practice, including tooling and supervisory work at the Douglas Aircraft Inc., Oklahoma, City, Oklahoma.

American Locomotive Appointments

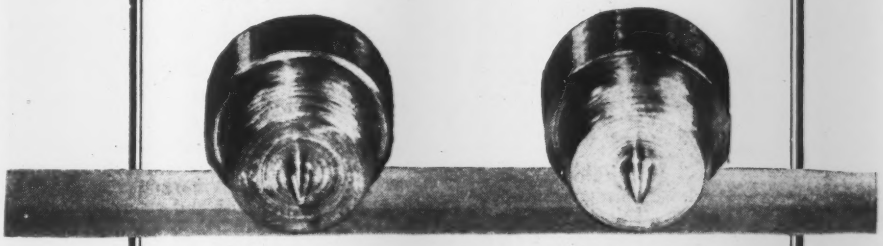
The Executive Committee of the Board of Directors of the American Locomotive Co. recently announced the following appointments: Perry T. Egbert, Vice President in charge of Diesel Locomotive Sales; William S. Morris, Vice President in charge of Steam Locomotive and Divisional Sales and James D. Vaughan, Comptroller.

Mr. Egbert has served the company in sales capacities since 1921, when he was appointed technical representative in the Far East, returning to the U. S. in 1924. He graduated from Cornell in 1915 with a Mechanical Engineering degree, was employed by the Lehigh Valley and Norfolk & Western railroads and from 1916 to 1919 served as a pursuit pilot in the U. S. Air Corps. In 1920 he joined the Engineering Department of the American Locomotive Co.

Mr. Morris was formerly executive vice president of the Montreal Locomotive Works, Ltd., the company's Canadian subsidiary. He entered the locomotive business in 1922 as a special apprentice at the com-

Continued on page 44

before and after



How the right cutting fluid pays

FIRING PINS or cylinder barrels . . . shells or ship shafts . . . plants that make them use cutting fluids—most often *good* cutting fluids. Often, however, one cutting fluid is expected to fit every job. Usually it won't, for when the operation—speed, feed, tools or stock are changed a new set of conditions exist. That means the cutting fluid factor must be considered carefully on every job—and the *right* fluid determined for it. Such consideration pays well.

The stainless steel parts illustrated above are a good example. It is obvious from these unretouched illustrations that the piece on the right has the better finish on both face and thread. This improvement over the left hand piece was due solely to a change in cutting oil to the *right* oil for the job. And this *right* oil proved to cost 14c per gal. less, on the machine. In this case a simple blend of Stuart's Thred Kut 99 was the answer—but it might have been any other of several Stuart Products.

At the Metal Show . . .

the above parts and hundreds of others will be on display at the Stuart Oil exhibit — drop in.

The important fact is found in the experience and specialization of Stuart Oil Engineering in applying proved products . . . in helping you find the *right* cutting fluid with the least trouble and cost to you. Let a Stuart Oil Engineer work with you.

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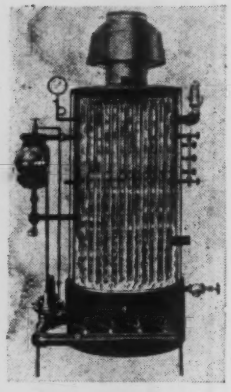

It delivers more horsepower per unit of floor area than produced by an ordinary vertical fire tube designed boiler occupying equal floor space. Write for further details.

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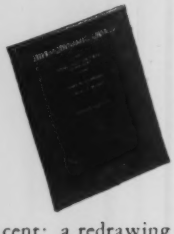
THERMODYNAMIC CHARTS

By FRANK O. ELLENWOOD and CHARLES O. MACKEY



New conveniences in this second edition of the well-known "Vapor Charts" include an entirely new form of chart for steam and water mixtures having qualities less than 80 per cent; a redrawing of plates 8 and 9 to include the pressure scale for the saturated liquid; addition of scales to the ammonia and freon charts to give the specific volumes of the saturated liquids. To enable the enthalpy-volume charts for steam to be used more conveniently the page numbers of the adjoining plates have been added on the margins of each plate.

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pany's Schenectady plant. From 1926 to 1940, when he became Vice President of the Montreal subsidiary, he held various sales positions with the company, including a four-year period as District Sales Manager with headquarters in Chicago. He served in the U. S. Army during World War I and graduated from the U. S. Naval Academy in 1922.

Mr. Vaughan has been Executive Assistant to the President for seven years. Previously he was with Price, Waterhouse & Co. as supervising accountant and spent a number of years in Cuba in charge of the United Fruit Co. accounting office. He attended the Bentley School of Accounting, and Boston University and is a member of the American Institute of Accountants.

Joins Inco's Technical Service Group

H. O. Teeple, chemical engineer, has joined the Technical Service Group of the Development and Research Division of The International Nickel Co., Inc, at New York, T. H. Wickenden, Manager of the Division, announces. He will specialize in corrosion problems.

After graduation from the University of Michigan in 1937, Mr. Teeple became associated with the alkali and chlorine products industry, remaining there until coming to International Nickel. He has had experience in production, process control, and maintenance engineering, including equipment specifications, corrosion control and the use of metals, alloys, plastics, and special paints.

Walter H. Ridley Joins The Foxboro Co.

The Foxboro Co., makers of industrial instruments for measurement and control, announces that Mr. Walter H. Ridley has joined the Sales Promotion Department, at the head office, Foxboro, Mass. Since graduating from M.I.T. in 1928, Mr. Ridley has been engaged as designer and sales engineer for two well-known firms manufacturing textile mill machinery.

For the past two years he has been in the Boston office of WPB, where much of his work concerned the problems of the textile industry.

His extensive traveling, particularly in the East and South has given him a wide acquaintance with textile men and with their problems of production and engineering.

Wickwire Spencer Announces Operating Personnel Changes

The Wickwire Spencer Steel Co. announced today three important changes in its plan operating personnel. Mr. M. G. Werme, formerly Superintendent at the Clinton, Massachusetts plant, has been appointed Chief Development Engineer of the Company. Mr. Gordon Lloyd, has been appointed Superintendent at the Clinton Plant. Mr. Victor Chartner has been appointed Chief Mechanical Engineer of Wickwire Spencer.

Mr. Werme has been associated with Wickwire Spencer for the past twenty-five years, nineteen at the Clinton plant. He was appointed Superintendent there in 1935. In his new post it is expected that his outstanding record as Operating Engineer will be of inestimable value. Mr. Werme will make his headquarters at the Buffalo plant.

Mr. Lloyd, was formerly Power and Fuel Engineer for the Carnegie Illinois Steel Corporation, and Chief Engineer of the Loftus Engineering Corp., Pittsburgh.

Mr. Victor Chartner was previously with the Pittsburgh Steel Co., since 1930 as Chief Engineer. His long record in the steel in-

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RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

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dustry includes in addition, service with the Otis Steel Co. of Cleveland, the Pittsburgh Crucible Steel Co. of Midland, Pa., the Benson Mines Co. of New York, and the Jones & Laughlin Steel Co. Mr. Chartner will make his headquarters at Buffalo.

Torrington Appointments

The Torrington Co., Bantam Bearings Div., South Bend, Indiana, announces the appointment of Harold C. Olson as Sales Manager and John A. Toth as Assistant Sales Manager.

Mr. Olson studied Mechanical Engineering at the University of South Dakota and has been with The Torrington Co. since 1935. He was formerly district representative in Milwaukee and Pittsburgh and became Assistant Sales Manager in 1941.

Mr. Toth has been associated with Torrington since 1929. Also at one time Pittsburgh representative, he was special representative in the steel industry before his present appointment.

Link-Belt Promotions on West Coast

San Francisco, Calif.—Mr. Ralph M. Hoffman, president, Link-Belt Co., Pacific Div., announces the promotion of two Link-Belt stalwarts—Fred A. Koepf and George T. Lundquist.

Mr. Koepf, until recently asst. manager at Los Angeles, has been advanced to the position of district manager for northwest Pacific Division territory, with headquarters at Seattle, Wash.

Mr. Lundquist, until recently assistant to H. V. Eastling, vice-president and sales manager, San Francisco, succeeds Mr. Koepf as asst. manager at Los Angeles.

Fred Koepf became a "charter member" of the Link-Belt Pacific Div. family in San Francisco in 1923, when Link-Belt purchased Meese & Gottfried, by whom he was then employed. His transfer to Los Angeles came in 1927. Over a period of years, he has handled purchasing, credits, billing merchandise and order work.

George Lundquist began his enviable record of service in the "old" Link-Belt San Francisco plant in 1925. He got his experience "the hard way," starting as a stock helper. Successively, he worked his way up as draftsman, order clerk, head of the San Francisco order department, and since 1941, assistant to the sales manager.

Kropp Has New Machine Shop Head

R. A. Hartman, for the past four years master mechanic for the Crosley Corp. in charge of tool design, process engineering, tool room and layout of production lines, has joined Kropp Forge Co. and Kropp Forge Aviation Co., Chicago, Ill., as superintendent of the machine shop, announces Roy A. Kropp, President.

From 1923 to 1936, Mr. Hartman was superintendent of the Cincinnati Precision Instrument Co. of Cincinnati, Ohio. Between 1936 and 1940, he conducted his own designing and engineering service.

Republic Flow Meters Appoints Berkley as Representative

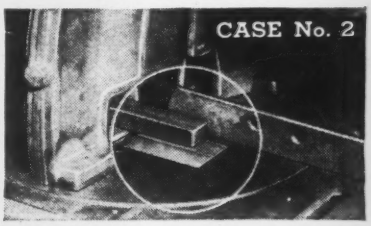
Republic Flow Meters Co., Chicago, Ill., announces the appointment of Merrill Berkley as its exclusive representative in Southern California and portions of Nevada and Arizona. Mr. Berkley who graduated from the California Institute of Technology at Pasadena, with a degree in Mechanical Engineering, has transferred from Republic's Chicago headquarters and will handle sales and application engineering and equipment service for Republic and allied manufacturers. Mr. Berkely, has held positions as

Continued on page 46

5 CASES WHERE KENNAMETAL INSERTS *Take a licking and like it!*

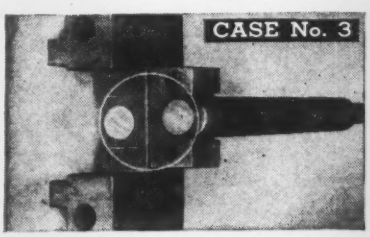
Condition: Grinder table had to be resurfaced frequently to maintain true grinding of tool angles.

Correction: Kennametal inserts provide true, flat surfaces that show no appreciable wear after many months' service.



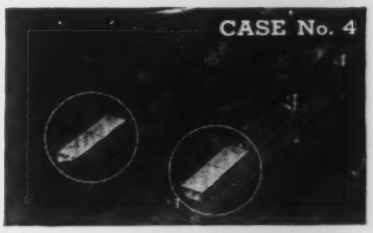
Condition: Worn sliding surfaces of abrasive saw rest allowed shank steel to wobble, causing uneven cut-off.

Correction: Inserts of Kennametal make smooth surface that outwears steel up to 100 times.



Condition: Steel parts of vise clamping mechanism badly galled by twisting action.

Correction: Kennametal discs, at abutting points, minimize wear; permit jaw to be closed securely, opened readily with less effort.



Condition: Wire cleaning brushes cut deep into steel leveling guides in less than one day.

Correction: Kennametal inserts resist the abrasion . . . after months' service, are still in good shape.

Condition: Steel surfaces of band saw guides wore quickly, allowing saw to weave and cause uneven profiling.

Correction: Inserts of wear-resistant Kennametal provide non-galling surfaces that guide the saw straight and true.

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If the service life of your products or production machinery is shortened by excessive wear . . . incorporate extremely hard, non-galling Kennametal parts at critical points. Kennametal is available in a variety of standard shapes (balls, discs, flat blanks), and it can be molded into almost any special form, limited only by reasonable proportions. Write for catalog information.

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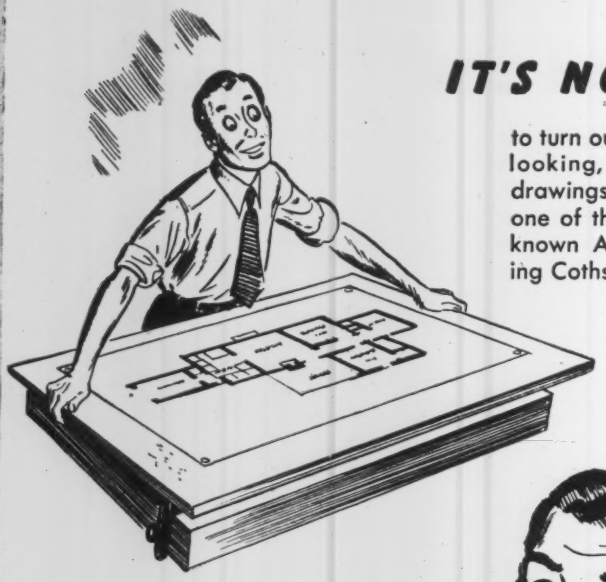

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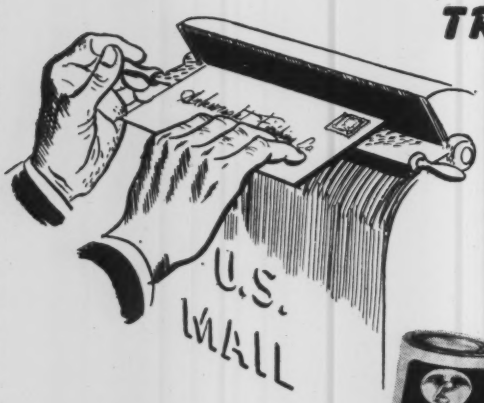

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heating and gas sales engineer with Autogas Corp., Republic Heaters Co., Missouri Natural Gas Co., and the former Los Angeles Gas & Electric Co. He has been associated with Republic and subsidiary companies for 8 years on application engineering and field supervision of Republic instruments and combustion and process controls.

Mr. Berkley's office is in the Lincoln Building, 742 So. Hill Street, Los Angeles 14, California. Phone Vandike 2573.

Graham Appointed Assistant to President of Peabody Engineering

David P. Graham, for several years manager of the Gas Scrubber Division of Peabody Engineering Corp., of New York, was made Assistant to the President at the last meeting of the Board of Directors. Mr. Graham was graduated from Stevens Institute with the Class of '23. He is a member of the American Society of American Engineers. In addition to his new duties, he will continue to direct the Scrubber Division.

COMING MEETINGS AND EXPOSITIONS

During the next three months

OCTOBER

2–4	The American Society of Mechanical Engineers, Fall Meeting, Hotel Netherland Plaza, Cincinnati, Ohio.
5–6	American Institute Mining and Metallurgical Engineers, Iron and Steel Division, Second Annual Conference Electric Furnace Steel Committee, William Penn Hotel, Pittsburgh, Pa.
12–14	American Society of Tool Engineers, Semi-Annual Meeting, Syracuse, N. Y.
16–18	American Institute of Mining and Metallurgical Engineers, Institute of Metals and Iron and Steel Division, Cleveland, Ohio.
16–19	American Welding Society, Annual Meeting, Hotel Cleveland, Cleveland, Ohio.
16–20	American Society for Metals, National Metal Congress and War Conference Displays, Statler Hotel, Cleveland, Ohio.
17–18	American Management Association, Office Management Conference, Hotel Pennsylvania, New York, N. Y.
30–31	Joint Meeting A.S.M.E. Fuels and A.I.M.E. Coal Divisions, Charleston, W. Va.

NOVEMBER

13–16	American Petroleum Institute, 25th Annual Meeting, Stevens Hotel, Chicago, Illinois.
14–15	American Management Association, Production Conference, Hotel New Yorker, New York, N. Y.
15–18	Society of Naval Architects and Marine Engineers, Annual Meeting, Waldorf-Astoria, New York, N. Y.
27–Dec. 1	The American Society of Mechanical Engineers, Annual Meeting, Hotel Pennsylvania, New York, N. Y.

DECEMBER

11–13	American Society of Refrigerating Engineers, 40th Annual Meeting, Hotel Pennsylvania, New York, N. Y.
11–13	American Society of Agricultural Engineers, Fall Meeting, Hotel Stevens, Chicago, Illinois.
12–13	American Management Association, Finance Conference, Hotel Biltmore, New York, N. Y.

Keep Informed

Gray Joins M.M.&M.

Manning, Maxwell & Moore, Inc., Industrial Specialists of Bridgeport, Conn., manufacturers of Ashcroft Gauges, Hancock Valves, Consolidated Safety and Safety Relief Valves and American Thermometers and Instruments announce that Harry W. Gray, until recently Assistant to the General Sales Manager of the Airtemp Division of the Chrysler Corp., Dayton, Ohio, has joined their organization.

Mr. Gray, a graduate of Purdue, 1928, with a degree in Mechanical Engineering has spent a number of years with large industrial concerns as Director of Service on product development and field research. With this background of product development and market research Mr. Gray, under the direction of C. H. Butterfield, Vice President in charge of Sales, will devote his time to an analysis to determine how Manning, Maxwell & Moore products can best contribute to the advancement of present day industry.

M.M.&M. Personnel Changes

Chester H. Butterfield, Vice President in charge of Sales at Manning, Maxwell & Moore, Inc., Bridgeport, Conn., announces the following changes in personnel as of July 1.

Paul M. Rolli, former representative on the Pacific Coast has been appointed Pacific Coast District Manager to replace Albert W. Coleman who has been appointed Sales Manager.

L. E. Gebhart is appointed Mid-Atlantic District Manager with headquarters at Philadelphia.

Charles Stepan has been appointed Manager of the newly created Electro-Mechanical Div.

Lee P. Stillman appointed Manager of the Tulsa Products Div.

James O'Connor appointed Sales Engineer with the Ashcroft Gauge Div.

Each of the appointments have been made to assure greater sales effectiveness during the post-war period.

Named Manager of Distributor Sales

Manning, Maxwell & Moore, of Bridgeport, Conn., manufacturers of Ashcroft Gauges, Hancock Valves, Consolidated Safety and Relief Valves, American Industrial Thermometers and Instruments announce the appointment of E. M. Dunlap as Manager of Distributor Sales.

For the past ten years Mr. Dunlap was Sales Manager of Ostermoor & Co., and for a number of years prior to this he was identified with distributor sales, specializing in market study, training of distributor salesmen and special distributor sales campaigns. He will take over complete charge of distributor distribution of the products of M.M.&M.'s Boston and Bridgeport Works.

Kramer Appointed Stover Lock Nut Production Manager

As a further step in expanding its output to meet war orders for its product for use in land, sea and air machines, the Stover Lock Nut & Machinery Corp. has named William H. Kramer, Jr., as production manager.

Mr. Kramer will direct increased production of the Stover Lock Nut under the Stover process at the company's recently enlarged plant on Bushkill Creek at Easton, Pennsylvania, according to Jordan H. Stover III, president.

Mr. Kramer is a graduate of Lafayette College, Class of 1931, with the degree of Bachelor of Science in Mechanical Engineering. In 1933 he served as service engineer with the Doughnut Machine Corp.

Continued on page 48

"Weather-or-No" ...the Color lasts

WEATHERPROOF
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5613 TERRA COTTA
5614 PURPLE
5615 LIGHT BLUE
5616 MADDER RED
5617 LEMON YELLOW
5618 LIGHT GREEN
5619 GRAY
5622 ORANGE
5623 BROWN
5624 VIOLET
5625 BLUE
5626 RED
5628 GREEN
5629 BLACK
5633 GOLD OCHRE
5637 DARK YELLOW
5648 OLIVE
5683 VANDYKE BROWN
5686 MADDER PINK
5640 COMBINATION RED AND BLUE

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Then for ten years he was in the production department of the Compressor Division of the Ingersoll Rand Co., first as student engineer and inspector of materials, later as expediter of production and materials, and then as assistant to the production manager.

American Air Filter Changes in Personnel

The American Air Filter Co., Inc., Louisville, Ky., announces changes in its organization, made necessary by the growth and expansion of the company's business. W. G. Frank has been made Assistant to the President, W. M. Reed. In Sales, H. C. Murphy, Vice President, has been appointed General Sales Director; John Hellstrom, Vice President, continues as head of the Dust Control Division; Howard W. Pound will be in charge of the Air Filter Division, and Wm. K. Gregory will direct the Special Products Division.

• LATEST CATALOGS

Bonding of Vinylite Elastomeric Resins

So much interst has been expressed in recent months for the bonding of "Vinylite" elastometric resins to themselves and to other materials that the Plastics Division of Carbide and Carbon Chemicals Corp. has published a 16-page booklet on the subject. This booklet includes: a summary of the standard methods for bonding "Vinylite" resin compounds; a general study of the adhesive materials employed; and detailed studies of formulas and methods for bonding "Vinylite" plasticized sheeting to itself, to metal, to ceramic surfaces, to leather, to wood, to concrete, to wall-board, to cloth, and to miscellaneous materials. Copies of this booklet are available to business executives upon request.

Latest "Yarway" Publication

Recently a new baby was born at the Yarnall-Waring Co., well-known manufacturer of steam equipment. He's been named the "Yarway News."

A copy of the first issue of this new house magazine is ready for your inspection, and we hope you will find the little fellow interesting enough to tell your readers something about it.

A few vital statistics follow for your information:

Height: From the plant operator to the top technical men in steam engineering.
Weight: 25,000 copies per issue (quarterly)
Disposition: (See the first issue.)
Antecedents: The "Yarway-Blow-off" (Oldsters will remember this 18-year-old predecessor)
Godfather: The Editor, Yours Truly.

Congratulations, condolences or child-raising suggestions will be thankfully received.

Evaluating the Forgeability of Steels

"Evaluating The Forgeability of Steels," latest publication of The Timken Roller Bearing Co.'s Steel and Tube Division, is an 8½" x 11", 78-page book, containing for the first time recommended forging temperatures of sixty-eight steels, as determined by the hot twist test conducted in The Timken Roller Bearing Co. laboratories, under the supervision of C. L. Clark, Timken Research Metallurgical Engineer.

The apparatus and procedures used are described and the results of tests on various steels interpreted. A free copy of the book may be obtained from The Steel and Tube Division, Timken Roller Bearing Co., Canton, Ohio, by writing on your letterhead.

Importance of Spring Design

To emphasize the importance of correct spring design, the Muehlhausen Spring Corp., Logansport, Ind., has just published a new eight-page booklet, "Springs Designed For The Job Improve Product Performance."

The new 8½" x 11" two-color booklet describes the four factors essential to designing a spring for an application correctly: 1—a thorough study of working conditions; 2—the use of the services of experienced spring engineers; 3—the choice of right material; and 4—the ability to fabricate a spring efficiently, regardless of intricate design.

The five basic types of springs are each illustrated and defined, and a wide variety of the many shapes and sizes into which these five types may be designed are shown. Covered in detail are twelve of the commonly used spring materials with descriptions of their characteristics. The specialized equipment that is necessary to produce efficiently the multitudinous variety of spring designs is demonstrated.

Copies of this new booklet may be secured without charge by writing to the Muehlhausen Spring Corp., 201 Michigan Ave., Logansport, Ind., and mentioning this magazine.

WEAPON FOR WORK

TUTHILL MODEL L PUMP
Helps Win Battles
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About the size of a hand grenade, this compact Tuthill small industrial pump is outstanding for hydraulic mechanisms, lubrication, fuel oil and liquid transfer service. Internal-gear rotary type, mechanically sealed. Capacities from .33 to 3 g.p.m. Pressures up to 400 p.s.i. Ring or foot mounted. Write for Model L bulletin.

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Here is a cross section of a severely corroded water cooled connecting rod of a large gas compressor. This corrosion is being controlled with our Chrom Gluconates.

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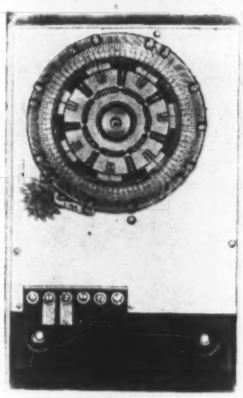
- *NEW EQUIPMENT*
- *BUSINESS CHANGES*
- *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

7 Day Calendar, Dial Time Switch



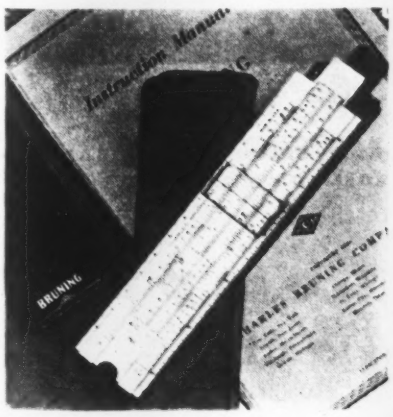
A significant development in time switches . . . . one which has proved its worth under today's exacting conditions . . . . is the Paragon 700 Series 7 day calendar, dial time switch. This unit has demonstrated its worth for timing automatic heat, ventilating, lighting, pumping or flushing operations. These switches are equipped with 6″ calendar dials which make one complete revolution every 7 days. Dial trippers can be independently set for different daily "On" and "Off" schedules. Settings can be made in advance for an entire week. Any day or days operations may be omitted entirely on a pre-set program.

Each day of week clearly separated from other days; graduated into hours and half hours; day and night distinctly separated. Operations from "On" to "Off" or from "Off" to "On" can be set as close as three hours apart and can be separately adjusted throughout each 24-hour day in the week.

Engineering bulletin available from Paragon Electric Co., 39 West Van Buren Street, Chicago 5, Illinois.

New High-Quality Slide Rule

To fill the need for a high-precision, high-quality pocket slide rule which could be offered to engineers at a moderate price, the Charles Bruning Co., New York and Chicago has just announced its new Bruning 2401, 5-inch Pocket Slide Rule.



In introducing this slide rule, the Charles Bruning Co. stresses the fact that this is not a "duration substitute," but rather a carefully made, smooth-working precision instrument designed for fast, easy operation.

A notable feature of the slide rule is the precision of its graduations. These graduations, being molded in, are an integral part of the rule—will not lose visibility through use. Graduations and numerals of the CI scale are in red to facilitate reading. Three screws in the back of the rule provide a simple adjustment for tension on the slide. The indicator is of glass and is easily replaceable in the event of breakage. This indicator is enclosed in a frame of stainless steel that holds it firmly in place and eliminates "wobble." A, B, CI, C, D, K, S, L and T scales are shown on the rule in order to adapt it to the widest possible range of service. The beveled edges of the rule are in graduated scales of both inches and centimeters.

Officials of the Charles Bruning Co. say the slide rule will sell for under $4.00, complete with natural leather case and instruction booklet.

A New Link-Belt Dryer Is Announced

A new type of dryer, to be called the Link-Belt Multi-Louvre Dryer, is announced by the Dryer Division of Link-Belt Co., 300 West Pershing Road, Chicago, for the low cost drying (or cooling) of bulk materials which do not require long retention periods.

The new dryer is described as a very compact, fully enclosed unit, containing moving louvres supported on power-operated endless chains. The function of these moving louvres is to present the material as it flows, to secure the most efficient drying (or cooling) action.

This mixing action and thorough contacting of the material with the heated air introduced into the unit is said to promote efficient drying and assure a uniformly dry material. The air which is drawn in through the moving mass of material and exhausted at the top of the dryer can be heated to the temperature best suited to the material being dried. Ample passages between louvres permit air circulation at low velocity.

The principle of passing air through a constantly mixing bed of material is the same as that employed in the company's Roto-Louvre Dryer, in which, however, the louvres are secured in a fixed position to the inside of revolving drum of dryer. It permits the use of relatively high temperatures without danger of overheating and results in rapid drying with none of the detrimental effects of forcing air into dryer at high temperature.

Fine materials can be carried on the louvres without clogging. The louvre-supporting chains are not in the path of the heated air, neither do they come in contact with the material being dried. This should result in longer life of the moving parts.

The new dryer is covered by a four-page illustrated folder No. 2009, which also shows the three other types of dryers Link-Belt builds.

Amsco Announces High Speed Steel Electrode

The American Manganese Steel Division of American Brake Shoe Co., Chicago Heights, Ill., manufacturers of "Conservation Welding Materials," has announced a new welding rod known as "Amsco Tool-face."

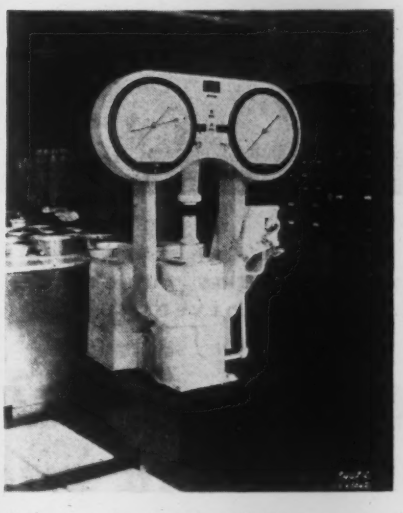
This new high carbon, high chromium' molybdenum, tungsten and vanadium bearing welding rod is commonly known as high speed steel. Its present uses are manufacturing composite cutting tools such as for lathes, shapers, etc. It is also used in manufacturing composite forging dies, rock drill bits, and for salvaging high speed tool steel parts that become broken or worn by impact and abrasion. It has a guaranteed Brinell hardness of between 575 and 675.

It can also be used as a general hard-surfacing rod where extreme hardness and resistance to shock is of primary importance.

Available in standard lengths and for gas or arc welding.

Southwark-Emery Cement Tester

Philadelphia—An important change in cement technology, revising all commonly-accepted concrete practice, has brought into play a cement tester made by The Baldwin Locomotive Works, according to F. G. Tatnall, head of the Baldwin-Southwark testing machine division.

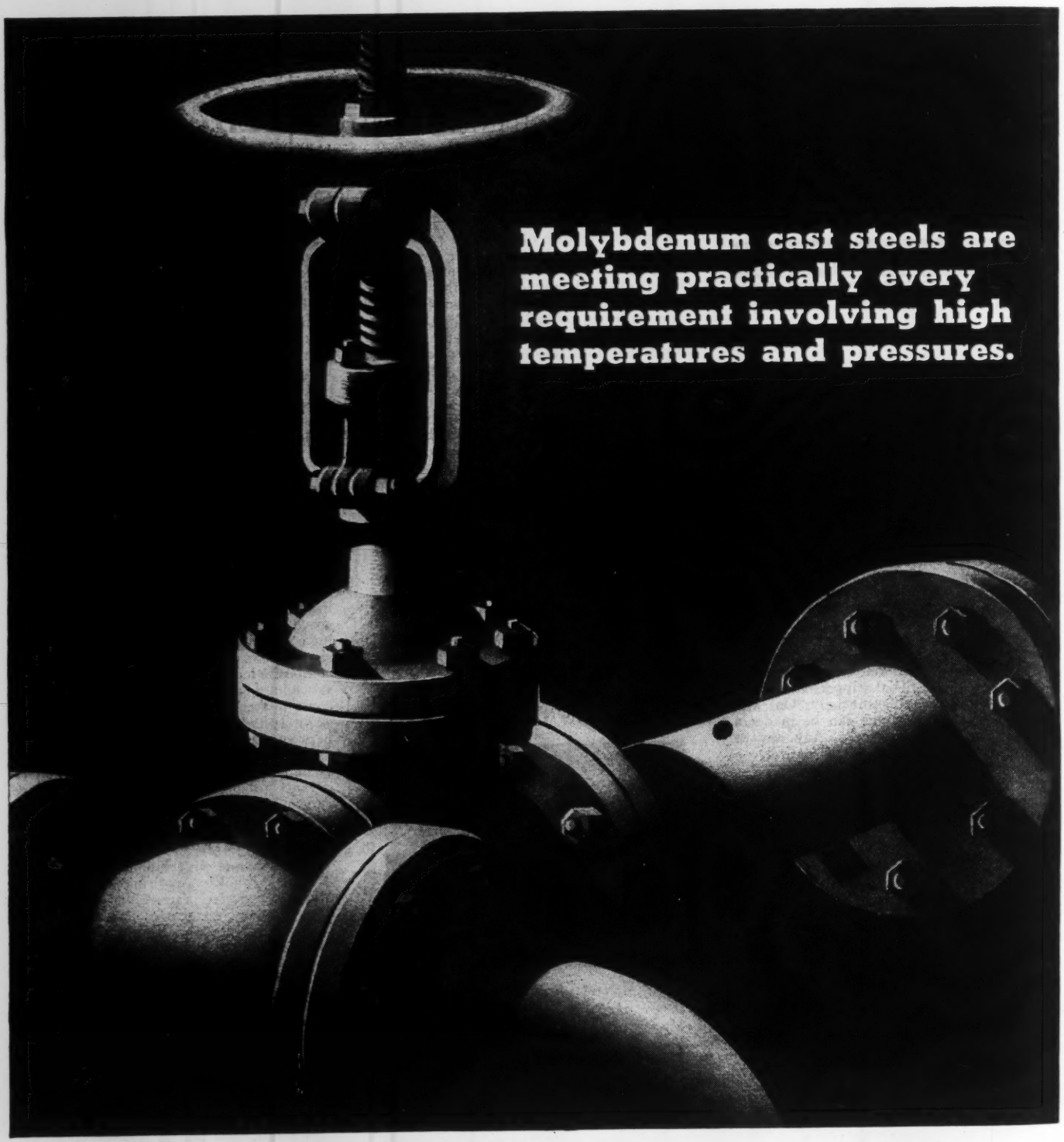


This is the Southwark-Emery cement tester, over a hundred of which are now in use in industry.

As Mr. Tatnall explains it:

"The new air-entraining cements recently come into prominence have reawakened in-

Continued on page 29



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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MOLY

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terest in the compression tests of 2″ x 2″ cement cubes, because these cements are probably better tested in compression than in tension. This in turn renews the interest of the cement industry in the 90,000 pound Southwark-Emery compression testing machine which in the past has been so widely used for compression testing of cubes and cylinders that there are over 125 in use in this country among cement companies, highway departments and government laboratories.

"This 90,000 pound cement tester was introduced in response to the requirements established in the early 1930's by the Working Committee on the Plastic Mortar Cube Test of Committee C-1 of the American Society for Testing Materials, which required all possible testing refinements so as to permit distinguishing very fine points of quality difference in cements. For instance, the requirements for such a machine were that it should have an accurate 'rate of loading control' paced by Telechron operated discs. Other requirements were that it should have a separate weighing system which in this case is provided by the Emery capsule, and that it have adequate dial scale length and requisite accuracy over the operating ranges. This is provided by the two dials 33″ scale length each, one of 90,000 pound and one of 10,000 pound capacity."

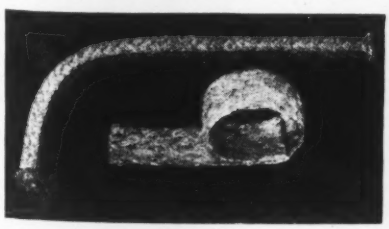
Specifications as to hardness, flatness and diameter of the compression plates were clearly established in these requirements.

Baldwin Southwark Corp. faithfully pursued their developments to follow all the performance requirements of the Committee and at the same time arrange to keep the price comparatively low by volume production methods of manufacture.

During the war the demand for this testing machine declined but it has again sharply increased due to the advent of the air-entraining cements. This is an interesting illustration of how advances in technology make new calls upon testing devices previously worked out for other uses and in fields where it was thought that the market was saturated.

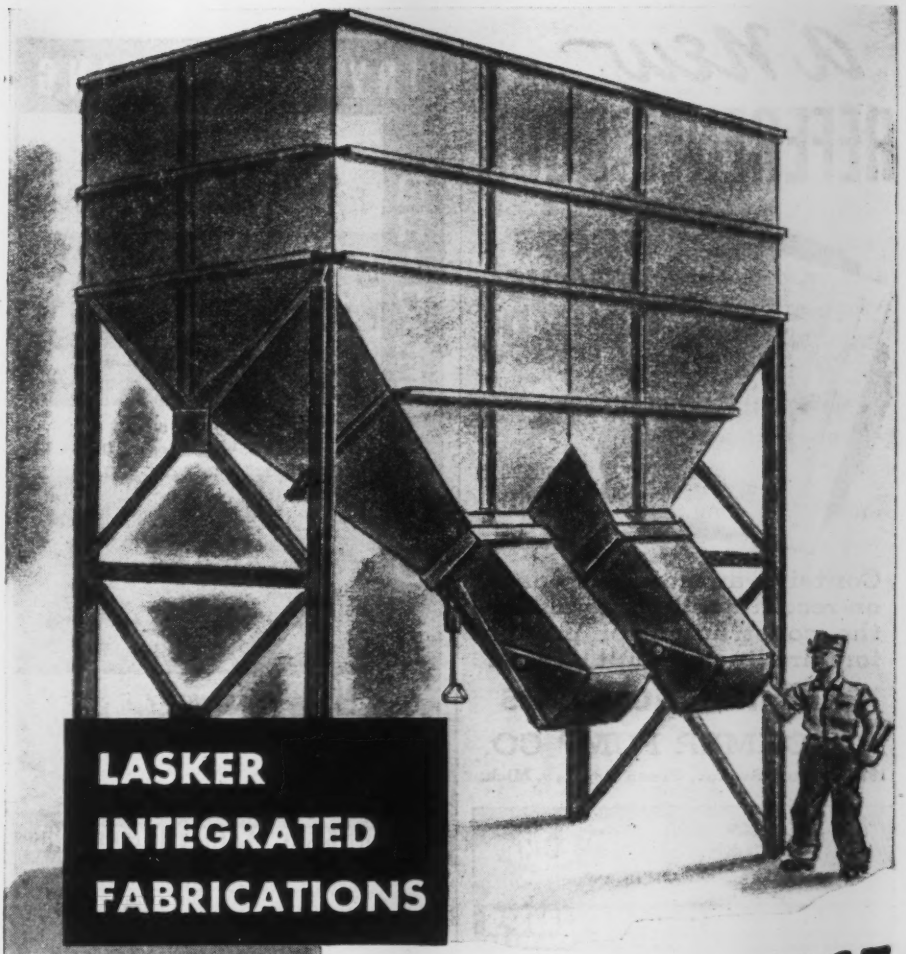
New Flexible Metallic Packing Withstands Corrosion, High Temperatures

A new type of flexible metallic packing capable of withstanding temperatures up to 2000°F. and highly resistant to corrosive gases, alkalies, and most acids, has recently been announced by Johns-Manville. Known as Inconel, and of a construction and toughness adapted to many industrial uses, this new packing owes its existence to the need for a material which would stand up under the exacting and destructive conditions existing in the exhaust systems of airplane engines equipped with turbo-superchargers.



In this service, flexible connections are necessary to absorb vibration between stationary and moving parts of the exhaust system. At the same time, these connections must prevent leakage of the exhaust gases which, due to low atmospheric pressures at high altitudes, have a greater tendency to

Continued on page 30



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Equipment Bases
Special Frames
Building Steel
Platforms
Walkways

SAVE TIME, COST AND EFFORT

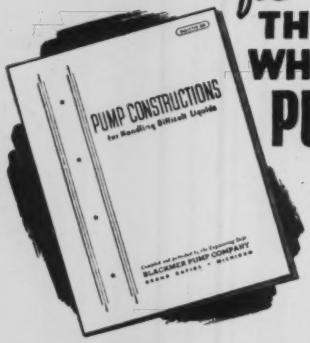
The purchaser of fabricated plate and structural-steel assemblies can often save time, expense and effort by ordering Lasker integrated fabrications. All the component elements of these assemblies — plate and structural steel, sheet metal work, machined parts, etc.—are integrated under a single responsibility. Lasker's engineering service includes design suggestions, detail drawings from general outline drawings, and production follow through from ordering to testing and delivery.

Users of this unique service include such leading companies as Westinghouse, Lummus Co., Johns-Manville, Westvaco-Chlorine and Consolidated Edison.

Details gladly furnished. Please address inquiries to Department M.

LASKER
ENGINEERING COMPANY
17 EAST 42nd STREET NEW YORK 17, N. Y.

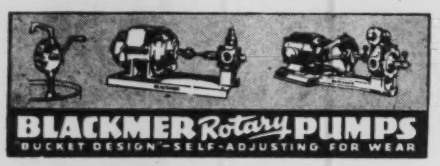
a New
REFERENCE BOOK
for
THOSE WHO USE PUMPS



Contains authoritative data on recommended metals for the construction of pumps for handling difficult liquids.

FREE TO ENGINEERS

BLACKMER PUMP CO.
1920 Century Avenue, Grand Rapids 9, Mich.

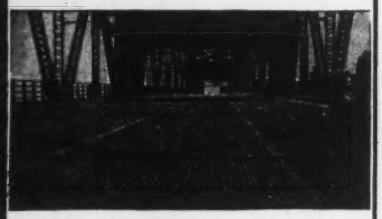


IRVING DECKING

BRIDGE FLOORING

OPEN STEEL GRID
SAFETY
Permanent Inwrought Traction
Self-Cleaning Surface

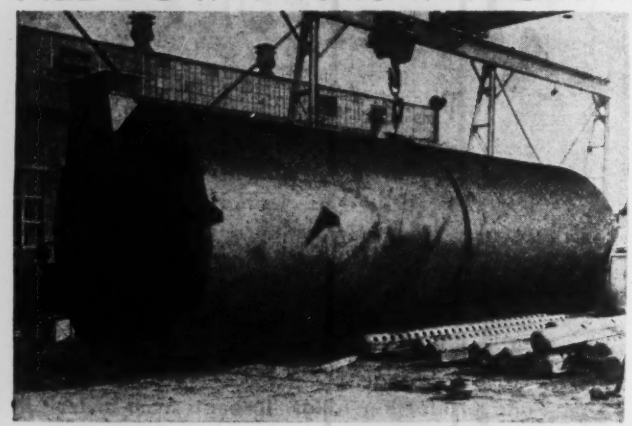
LIGHTWEIGHT
Only 15¼ lbs. per sq. ft.



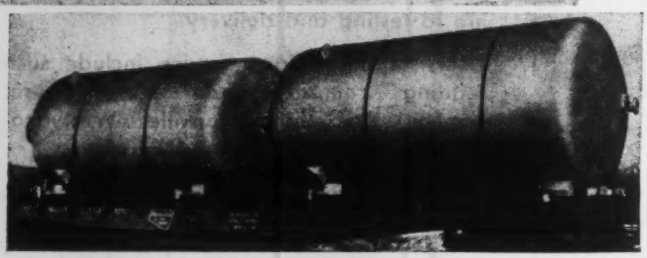
ECONOMY
Minimum Maintenance
Non-Erasible Lane Markers
Restores Old Bridges
Reduces Cost of New Bridges
May we send our catalog?

IRVING SUBWAY GRATING CO., INC.
ESTABLISHED 1902
HOME OFFICE and PLANT: 5010 27th STREET
LONG ISLAND CITY 1, NEW YORK
WESTERN DIVISION: FOOT OF PARK AVE.
EMERYVILLE 8, CALIFORNIA

ALL DOWNINGTOWN JOBS ARE *SPECIAL*...



Ordinary jobs get the same careful attention to detail that we give the most difficult job in the shop. Each job gets the benefit of Downingtown's 30 consecutive years' experience and adequate, modern facilities, insuring top-notch service.



The furnace (in upper illustration) is 12 feet in diameter and 38 feet long. It is welded and shipped "set up." The lower view shows a pair of welded tanks for the Process Industry. Our engineering consultation is always at your disposal.

DOWNINGTOWN IRON WORKS
DOWNINGTOWN, PA.
WELDED and RIVETED PRODUCTS

• Keep Informed

seepage with the possibility of injuring equipment or contaminating the cabin air supply.

No existing material was adequate to meet these unusual conditions until J-M engineers produced Inconel Packing. Made of a nickel-chromium-iron alloy in wire form, which is first knitted into mesh and then braided, the finished product has proved ideally suited to the service for which it was intended. In addition to its high corrosion and temperature resistance, the new packing is strong, resilient, and both non-scaling and non-magnetic. It is available in a number of styles, including square section packing in coil and tape forms, from which ring type gaskets may be formed. One style is made with asbestos fibres interwoven with the metallic alloy and serving as a sealing agent.

It is expected that this new packing, created to fill a specific need in connection with the war program and now available for industrial use, will find a multitude of applications where exceptional heat resistance and the ability to withstand corrosion are important considerations.

Brown Workers Get All Honors in New Army-Navy "E" Award

Employees were given the entire spotlight and all honors in the official acceptance by them for the Brown Instrument Co., Philadelphia precision industrial instrument division of Minneapolis-Honeywell Regulator Co., of the third Army-Navy "E" Award for war production excellency. Ceremonies took place recently.

The company decided, said E. B. Evleth, vice president and general manager of the Brown company, to grant to the workers all the honors which have twice before been shared by the military and Brown officials and executives. All the workers, said Mr. Evleth, have been chiefly responsible for the successful efforts the company has made for war. It is because of that fact, he added, that the company wanted to omit from the acceptance ceremonies all company officials and executives, likewise representatives of Army and Navy. The most recent award is the second renewal.

Two of the oldest Brown company employees raised the new "E" pennant on the company flagstaff. They were Hermena Mirtz, the only remaining woman factory employee of the original six which were hired, and Matt Hill who has been with the company 27 years. Over 40 workers, representing about three per cent from each department, were chosen to accept the new two-star pennant for the company.

Porter Builds Congo Locomotives

Weighing 229,000 lbs. each with tender, two unusually large wood-burning narrow gauge locomotives have recently been completed and shipped by H. K. Porter Co., Inc., of Pittsburgh, Pa., for service on the "Grand Lacs Railroad" in French equatorial Africa.

Running on a 1,000 mile single track line through the famous equatorial forest from Stanleyville on the Congo River to Albertville on Tanganyika Lake, the engines will use wood from the forests for fuel, there being no coal or fuel oil in that part of Africa. Native crews will man the engines exclusively.

The locomotives are built with large fireboxes and boilers for hauling heavy loads on long uphill grades which characterize the route. Their gauge can be changed from 39-3/8 inches to 42 inches with only minor

• Keep Informed

mechanical changes with a view to future possible uses on connecting roads.

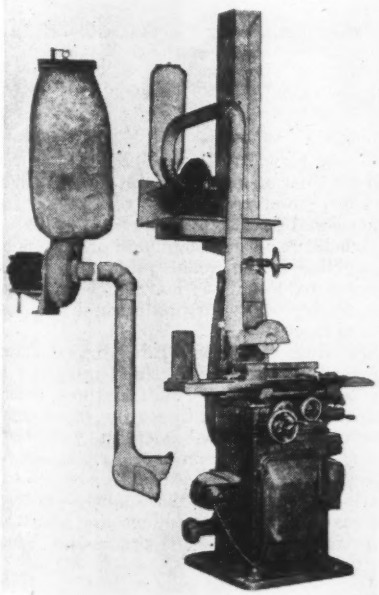
Heavy military transport is now being hauled on the "Grand Lacs" road, in addition to such raw materials as copper, tin, wolfram, tungsten, coffee, cotton, rubber, gold. The road connects with the Tanganyika Railway, forming one of the main links in the transport system across the continent which terminates on the east coast at Dar-es-Salaam.

The locomotives are of the Mikado type, class 2-8-2, with 19″ x 22″ cylinders and eight driving wheels of 48 inches diameter. Approximate weights are engine total 144 - 000 lbs. and drivers 106,000 lbs., tender 85,- 000 lbs. Tractive force is 28,125 lbs.; factor of adhesion 3.7; height 11 ft. 10 in.; width 9 ft. 8 in.; length over bumpers 57 ft. 3 in. Boiler is straight radial type, 62 in. diameter; pounds pressure per sq. in. 200. Firebox has a top width of 53 in. and bottom 72 in. Grate area is 42 sq. ft. Tender holds 4500 U. S. gallons. Fuel capacity, wood, is 600 cu. ft.

A Simplified Individual Dust Collector for Each Machine Powerful, Efficient, Noiseless and Inexpensive

Dust breathed into your lungs daily is too big a price to pay to be without this health protector.

Leiman Bros. powerful suction dust collector handles 600 cubic feet free air per minute with a 1/4 HP motor at 3500 RPM, stands 47″ high with 9″ diameter dust bag, 3″ pipe and elbows, and dust hood—runs from any electric light socket.



Quicker and better work can be done where the grinding dust is automatically sucked away as you work. Little space occupied yet concentrated suction power keeps your work clean.

Dust sometimes looks quite harmless, especially when it is a very light dust or a very thin dust. Of course when dust becomes very heavy and very thick, then we do something about it. We do it very quickly too—and if our employees working in the dust do not come right out and quit on us, they do begin to work slower, producing less and less valuable output as the time goes on.

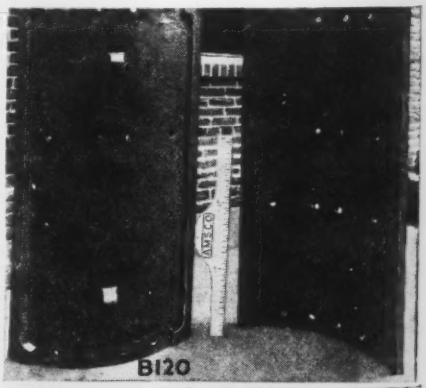
Continued on page 32

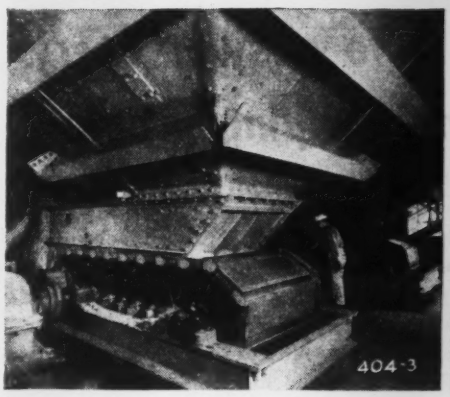
Record Output from Adirondacks Mines Aided by *"The Toughest Steel Known"*

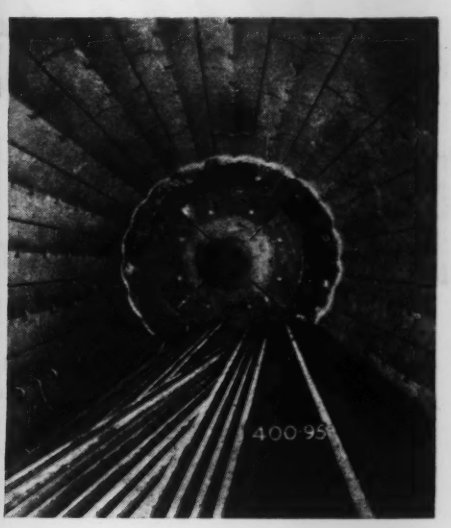
Additional millions of tons of iron ore are being poured into the war machine from the redeveloped, historical Adirondacks area where output has reached an all-time high.

As in all metal mining and processing operations, the equipment used is subjected to stresses and abrasion that tend to destroy it quickly, causing high maintenance expense and production delays. The Adirondacks mines planned for longest equipment life and continuous operation by using austenitic manganese steel wearing parts wherever its application is logical.

Accordingly, such units as slusher hoes, apron feeders, gyratory, jaw and roll crushers, ball and rod mills, hoppers and chutes, and surface-operated power shovels are fitted with "the toughest steel known" wherever it will do the most good. Some of these applications are pictured.







B-120. Back castings for slushers or scrapers, such as those shown in picture 66289, used in underground mines for scraping ore from stopes to cars. The customer stated, "Manganese steel is specified because it is the best metal for resisting the stresses and abrasion in this work."

404-3. Two Stephens-Adamson Amsco apron feeders (Brayton patent) feeding ore to screens from storage bins. Maximum capacity 700 t.p.h. each.

400-95. This Allis-Chalmers 9′ x 16′ peripheral discharge rod mill, now dry grinding in an Adirondacks mine, is equipped with Amsco manganese steel liners.

Amsco "Conservation Welding Rods" described in Bulletin 941-W.

Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois

AMERICAN Brake Shoe COMPANY

FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

• Keep Informed . . .

Nobody can blame anybody else for slowing down and becoming more or less befogged if they are working under dusty conditions. Taken all in all, dust means loss—in time, in output, but most of all in temporary or permanent injury to the health.

But very light dust, very thin dust, dust that oftentimes you can hardly see is something else again. Heavy dust is its own danger signal but not so the very light dust. There is little indication of danger, yet we know it is there.

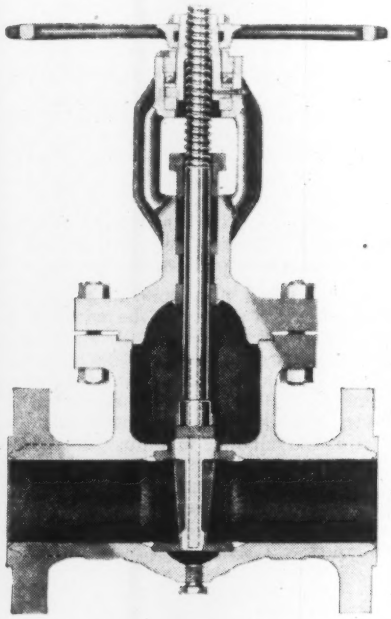
This is the kind of dust that is most easily breathed into the lungs, that most easily and most rapidly causes disease—colds, pneumonia, silicosis, tuberculosis, and what not—all dangerous yet all so unnecessary.

Employers are doing everything they can to increase production and at the same time to improve working conditions. Here is one of the greatest hazards to which workers are exposed. Banish it and usually absenteeism drops, production increases, better all-around conditions ensue. Contented workers are better and more productive workers.

And all of this is accomplished very simply and very inexpensively by means of the simplified, self-contained dust collector shown in our picture. It is adapted for use with grinding and polishing wheels or any other dust creating tool. Leiman Bros., experts in dust collecting units for 50 years, are placing this little device in shops and factories, large and small everywhere. Any shop can afford one or more of them. Send to Leiman Bros., 118–75 Christie Street, Newark, 5, N. J., for free information.

Edward Introduces New Steel Gate Valves

A completely new line of cast steel gate valves, with basic improvements in design, has just been introduced by The Edward Valve & Mfg. Co., Inc., East Chicago, Ind.



A new Edward Gate Valve Catalog No. 12-E1 is just off the press and includes illustrations, complete details of design, and dimensional data.

To achieve perfect alignment of all working parts, close fitting wedge guide ribs are constructed by a new method which eliminates unnecessary and wear-producing drag across seating faces.

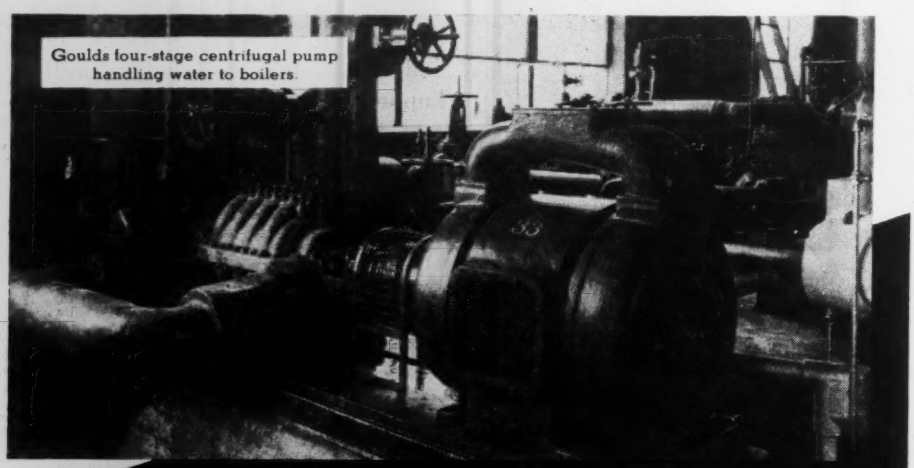
Seat rings of the new Edward gate valves are hard surfaced and welded integrally to the body. Specially built fixtures permit hydrostatic test of both seating faces simultaneously, in contrast with the customary procedure of testing one face at a time. All Edward gate valves 4 in. and larger are ball bearing equipped. In the smaller sizes bearing plates for yoke bushings are EValized, a special Edward plating process, to reduce operating effort.

The new Edward gate valves are being built in 300, 600, 900 and 1500 lb. sp classes and in sizes $2\frac{1}{2}$ to 12 in. inclusive. They are available in some sizes and pressure classes for immediate shipment out of stock.

Assembly Line Method of Removal of Sand Used in Molds

The Walworth Co., Inc., of Boston has introduced the assembly line method into the removal of sand used in the molds in its sixth floor foundry.

The metal which eventually becomes flanges, elbows, tees and valve bodies is poured into sand molds. After the metal has cooled, how to get rid of the sand? The company devised an efficient answer to that one.



Goulds
the PUMP FOR the JOB

to answer every power plant pumping problem

Power plants that during these strenuous days are called on for capacity operations around the clock are not surprised at the way Goulds Pumps are taking this continuous overload duty in their stride. During all of the 96 years of Goulds history, power plants have been depending upon Goulds pumps for every liquid handling operation.

When planning on new facilities or replacements look to Goulds. From Goulds complete line you can select *the* pump for *the* job—whether it is boiler feeding, hot and cold water circulating, sump, cooling tower or any other duty.

Goulds PUMPS INC.
SENECA FALLS, N. Y.

• Keep Informed

A table stretching the entire length of the 400-foot foundry room has been inset at intervals with 16 gratings of the Irving Subway Grating Co. of Long Island City.

Over the center of each grating and parallel to the length of the table is a steel bar on supports. The worker raps the sand mold on the bar, the cast product drops out and the sand falls through the grating. Under the table is a wide, endless belt which carries the sand to a hopper.

The gratings are called "shake out" units. Each is three feet by four feet and is 1 3/4 inches deep.

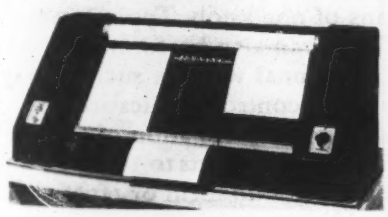
Fourth Maritime Award for Jenkins Bros.

The United States Maritime Commission's "M" pennant with four gold stars was raised over the Jenkins Bros. plant in Bridgeport recently. It is the fourth time that the plant has been so honored since the initial award in March 1943.

Officiating at the simple ceremony on the lawn before the factory, were Bernard J. Lee, vice president in charge of manufacturing, and members of the Labor-Management Committee of the plant. Left to right: Maurice Eichenblatt, John Meyers, John Shuk, Henry Gora, Leroy Cox, William Calnan, Frank Womack, John Lankton and Joseph Schultz.

"Although the war news is very good," said Mr. Lee, "our men and women continue to work hard to turn out our valves which they know are vital to every type of fighting ship sailing under the American flag. I have confidence they will not cease their efforts until the moment the war is won."

Double Reproduction Advantages With New Bruning BW-Copyflex Printer



New reproduction advantages—as well as double utility—are offered by a new machine recently announced by the Charles Bruning Co. of Chicago. This machine, the BW-Copyflex Model 2 Continuous Printer, makes it possible to duplicate anything drawn, typed, printed or illustrated, as well as to make BW Prints . . . providing complete reproduction facilities for any type of industry or business.

This BW-Copyflex Continuous Printer exposes, with the use of Copyflex materials,

Continued on page 35

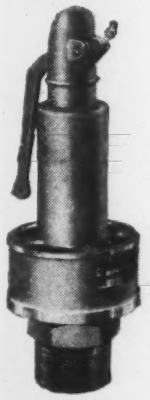
TWO FOR YOU . . .

MODELS KDP AND ODP

POPULAR **LONERGAN**

BRONZE SAFETY VALVES

Are Used All Through Industry for Pressure Safety Protection on portable and stationary boilers . . . on heat exchangers, kettles, tanks, and steam lines . . . on air compressors, Diesel engine systems, and on many other types of pressure equipment. These valves are nationally recognized for quality, workmanship and dependability.



KDP

KDP **is a top-outlet valve.** *ODP* **has a side outlet so that the discharge can be piped away. Both valves conform to A. S. M. E. Code requirements, and are National Board approved. For further details, write for copy of our Bulletin 501-A—which also describes the complete modern line of Lonergan Iron and Steel Safety Valves for all types of boilers.**

Sales and engineering service is available through LONERGAN representatives located in principal cities . . . there are distributors to serve you in every important industrial center.

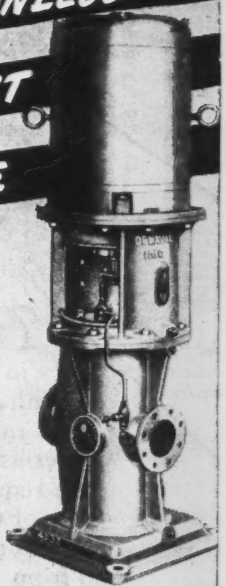
ODP

Lonergan

J. E. LONERGAN COMPANY, 2nd & RACE STS., PHILA. 6, PA.

SAFETY VALVES • RELIEF VALVES • PRESSURE GAUGES • SPECIALTIES

VIBRATIONLESS
COMPACT
SIMPLE



IMO
I MOVE OIL

The **DE LAVAL ROTARY OIL PUMP** has only 3 moving parts, no gears, no valves and no separate bearings. It propels any grade of oil in any volume in a smooth, steady stream against any pressure, like a piston moving always in one direction. The IMO motor-driven pump here shown is one of five in lube oil service on each of the largest and fastest Great Lakes ore carriers.

Ask for Publication I-106

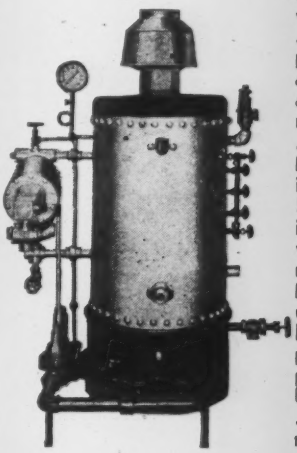
IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton, New Jersey

This small boiler . . .

Will Save You Money

USE THE MKAYO AUTOMATIC GAS FIRED STEAM BOILER

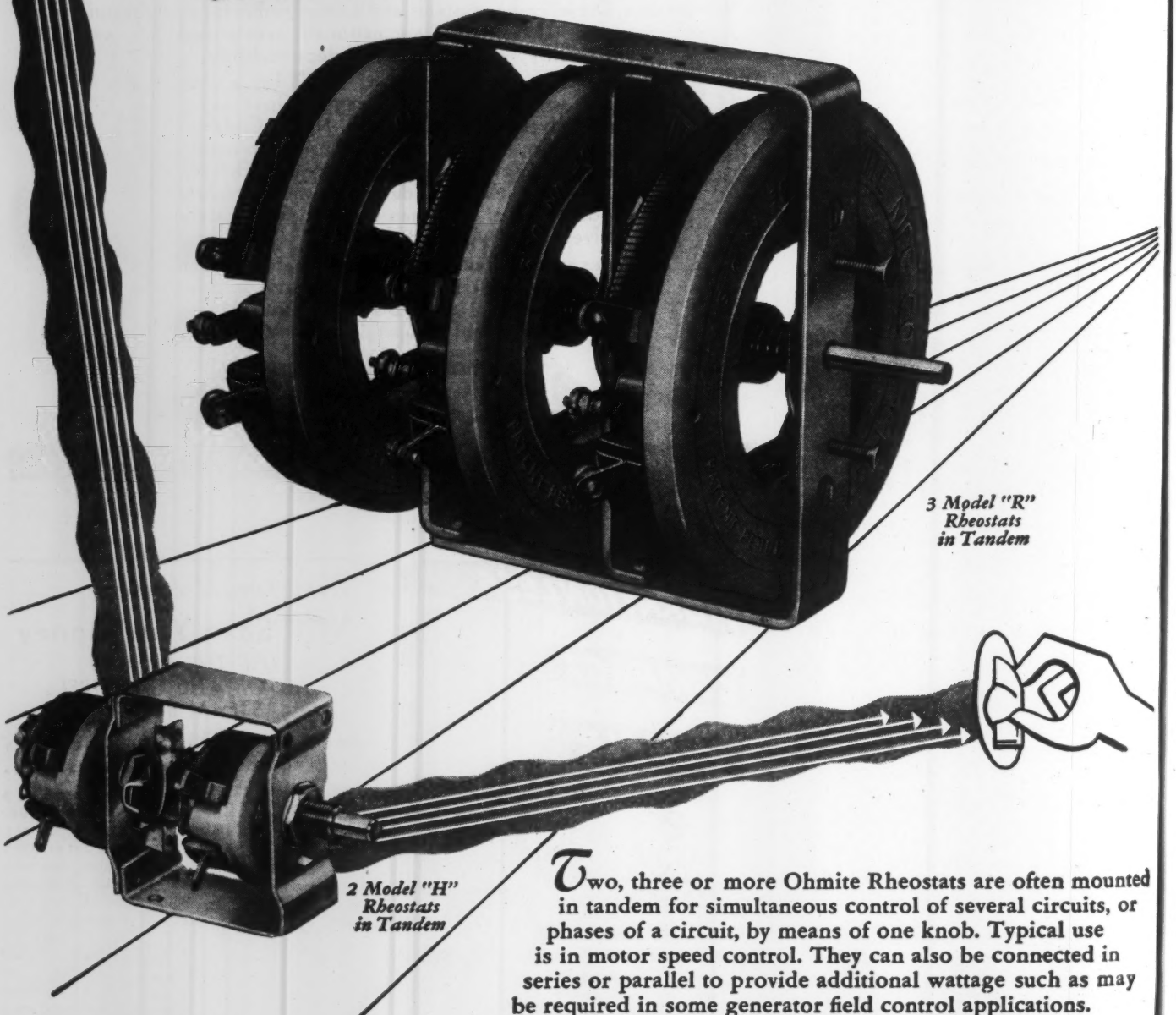
Because . . . it consumes less fuel, conserves labor, saves time.



Supplies clean steam with safety . . . it is compact, operates automatically and is economical to use . . . easy on fuel. Built in sizes 3/4 to 5 H.P., and in accordance with ASME requirements for pressures up to 100 lbs. Bring us your problems for post war boiler work . . . our engineering consultation is at your disposal.

MEARS-KANE-O'NEILL
Manufacturers of Automatic Steam Boilers
for over a third of a century
1903-1915 EAST HAGERT STREET, PHILADELPHIA 25, PA

OHMITE Rheostats in Tandem
For Simultaneous Control of Several Circuits



3 Model "R" Rheostats in Tandem

2 Model "H" Rheostats in Tandem

Two, three or more Ohmite Rheostats are often mounted in tandem for simultaneous control of several circuits, or phases of a circuit, by means of one knob. Typical use is in motor speed control. They can also be connected in series or parallel to provide additional wattage such as may be required in some generator field control applications. Any of Ohmite's ten rheostat sizes, or combination of sizes, may be utilized... rheostats ranging from 25 watts to 1000 watts and from 1-9/16" to 12" diameter... with uniform or tapered windings. Concentric control assemblies can also be produced.

In Resistance-Control, Ohmite Experience Makes a Difference!

• *Write on company letterhead for Industrial Catalog and Engineering Manual No. 40. Gives helpful information on the selection and application of Rheostats, Resistors, Tap Switches. Address Ohmite Manufacturing Co., 4983 Flournoy Street, Chicago 44.*

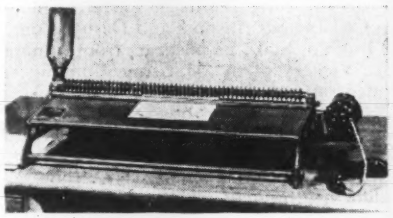
OHMITE MANUFACTURING COMPANY
4809 FLOURNOY STREET • CHICAGO 44, ILLINOIS

Be Right with OHMITE
RHEOSTATS • RESISTORS • TAP SWITCHES

• Keep Informed

tracings, line drawings, specifications, Van Dyke negatives, blue prints, etc. Original material with copy on both sides can be reproduced on either side or both sides Copyflex Prints are developed in trays and dried in a simple drier (readily available). With the flick of a switch, the Model 2 becomes a BW Printer for exposing Black and White Prints. Another new Bruning machine—the Model 153-M BW Developer is used for developing BW Prints exposed on the Model 2. Prints are delivered ready for use.

Compactly designed, the Copyflex Printer fits in desk-top space. It exposes roll stock or cut sheets up to 24 inches wide at a speed of 5 inches to 30 inches per minute. Because it is a continuous printer, speed of reproduction is considerably increased.



With the Bruning Model 153-M BW Continuous Developer, even an inexperienced operator can at once develop Black and White Prints in sufficient quantity for the moderate user. The machine develops cut sheets or roll stock up to 24 inches at a speed of 12 feet per minute. Like the Model 2 Printer, the 153-M Develper is built with exceptional compactness.

Brown Instrument Cited for Security Measures

The National Security Award has been received by the Brown Instrument Co. for outstanding wartime security measures. Official presentation of the certificate of award and O.C.D. pennant was made during ceremonies recently held in Philadelphia. E. B. Evleth, vice president and general manager of the Brown company, a division of Minneapolis-Honeywell Regulator Co., accepted the certificate of award, the seventh won by Philadelphia organizations.

Titeflex, Inc. Receives Second Army-Navy Award

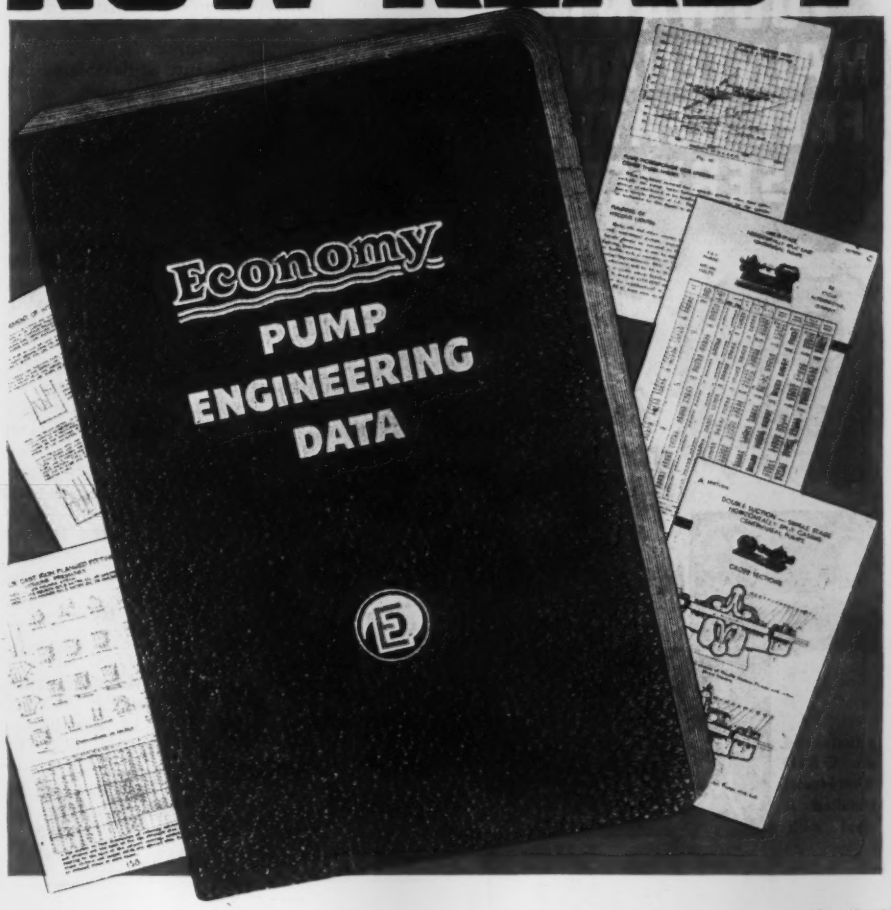
For a second time the Army and Navy have awarded to Titeflex, Inc., of Newark, the Army-Navy "E" award for excellence in war production. A white star will now be added to the "E" pennant which flies from the flagstaffs of the Company plants in Newark, Elizabeth, and Perth Amboy. The award has just been announced to the employees in a letter from Under Secretary of War, Patterson.

Titeflex, a long-established industry in peace-time, has become, during the war, one of the largest manufacturing concerns in the North Jersey Area. Thousands of employees are employed in its plants located in Essex, Union, and Middlesex counties, and the products which they manufacture have helped equip vast quantities of airplanes, tanks, combat vehicles, and Naval landing craft.

A majority of American warplanes fly equipped with radio shielded ignition harnesses manufactured by Titeflex. This equipment physically protects the plane's ignition system from the elements, but—more important—completely dampens electrical noise from the ignition system so that aircraft radio and electronic devices may operate.

Continued on page 36

NOW READY



GIVES YOU THE ANSWERS TO PUMP-ENGINEERING PROBLEMS

A timely contribution to the pump industry—350 pages of 1945 data just when vital postwar problems require authentic facts, sound experience and advanced engineering practice.

Here, under one cover, are hundreds of handy tables and diagrams you need every day. Revised, improved and new data governing the correct layout and installation of sewage, drainage, processing, heating systems, etc. Describes clearly and exactly the way to do the job right.

Indispensable to Executives, Engineers, Plant Managers, Maintenance Men, etc. Sent free in response to requests on business letterheads.

NOTE: There still are some valuable territories not under sales contract. Write for information on sales plan and distribution of Economy Pumps.

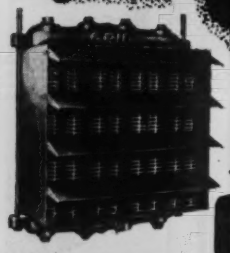
WRITE FOR YOUR COPY!

ECONOMY PUMPS, INC.

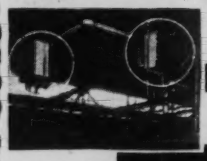
HAMILTON, OHIO • U. S. A.

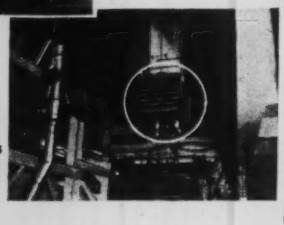
FOR OVER THIRTY YEARS MAKING BETTER PUMPS DO MORE

IF YOU WANT MAINTENANCE FREE HEATING SERVICE



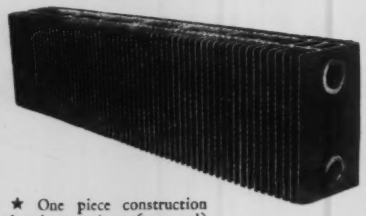
Install GRID UNIT HEATERS





Illustrated are GRID Unit Heaters installed in steel mills

and here's why!



★ One piece construction heating sections (patented) of high test cast iron that withstand steam pressures up to 250 lbs.

★ No soldered, brazed, welded or expanded connections to become loose or develop leaks.

No electrolysis to cause corrosion, breakdowns, leaks, or heating failures.

HIGH TEST CAST IRON HEATING SECTIONS

"We have in our plant 20 GRID Unit Heaters that were installed in 1931, and to date they have required no maintenance and have been eminently satisfactory. Due to the chemical conditions in and around our plant other than cast iron heating construction has not served our purpose," reports one large manufacturer. Another plant says, "We consider the materials used in their fabrication as being ideal for providing corrosive resistance." It's the material that makes the difference in GRID Unit Heaters, so compare them with any unit heater on the market today. No other unit heaters have their lasting qualities. Install GRID Unit Heaters for permanency and efficiency. Complete data and capacity tables upon request.

GRID

D. J. MURRAY MANUFACTURING CO.
Wausau, Wisconsin

• Keep Informed . . .

Titeflex ignition harnesses—also used on many tank engines—are a development which stem from the Company's years of experience in the manufacture of flexible metal tubing for a variety of industrial and automotive uses. On the other hand, jeeps, landing craft, and combat vehicles use Titeflex flexible metal tubing for fuel, oil, and air lines which will remain leak-proof under the most grueling combat conditions.

While its War Production record has been outstanding, Titeflex looks forward to the Post-war period with confidence that it can continue to do a large volume of business. This will be made possible through improved manufacturing techniques and additions of new products to its present line.

Part of this enviable production record must be credited to the harmonious cooperation existing in Titeflex between Management and Labor. Labor in Titeflex plants is represented by Local 260, U.A.W.A., C.I.O., and during the entire War emergency there has never been a work stoppage in any department of any Titeflex plant. Such a record reflects credit upon both the Industrial Relations policies of the Management and the cooperative spirit of the Local Union.

Westinghouse Plant to Receive Army-Navy "E"

The Cleveland Lighting Div. of the Westinghouse Electric & Manufacturing Co. will receive the Army-Navy "E" Award for "outstanding production of war materials," it was announced by Wilfred F. White, Division manager.

Notification of the award was received in a letter from James Forrestal, Secretary of the Navy, who wrote that "this award is your nation's tribute to your effort and to your great work in backing up our soldiers on the fighting front. I have full confidence that your present high achievement is indicative of what you will do in the future."

Ceremonies commemorating the award will be held at a later date, Mr. White said, and would be kept as brief as possible in order not to interfere with war production.

The Cleveland plant has been producing searchlights for Navy shipboard use, landing field lights and floodlights for military and civil airports, and a variety of other lighting equipment for the armed services.

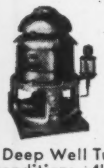
Farrel-Birmingham Awarded Maritime "M" and Victory Fleet Flag

The United States Maritime Commission has announced the award of the Maritime "M" to the three plants of Farrel-Birmingham Co., Inc., at Ansonia and Derby, Conn., and Buffalo, N. Y. A telegram from Admiral H. L. Vickery of the Maritime Commission notified the company of the award, which is given in recognition of outstanding achievement in the Commission's shipbuilding program.

In his acknowledgment, Mr. John W. Haddock, President of Farrel-Birmingham Co., Inc., said, in part: "We deeply appreciate this signal honor, and every member of our organization will be extremely proud of this award. We are glad that we have been able to contribute towards the great achievement which the Maritime Commission has accomplished in providing the bridge of ships necessary to adequately serve our fighting forces who are carrying victory with them to the far corners of the world."

A brief review of the Company's production record in building gear drives for cargo ships and seagoing tugs indicates that this

We Are Doing Our BEST for UNCLE SAM



Aurora Deep Well Turbines for all conditions—4" to 24"

SEE OUR CATALOG IN SWEET'S

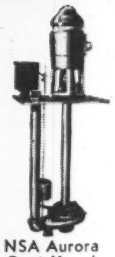
Aurora Pumps are the products of Experience. The Aurora Personnel has but ONE objective—the building of fine pumps. We are not jacks of all trades. We are exclusive pump builders. The splendid record of thousands of Aurora Pumps on a myriad of war services is your assurance that your post-war needs will be superbly taken care of as you, too, install "Pumps by Aurora."

Write for CONDENSED CATALOG M

We'll Do the Same for YOU

The splendid record of thousands of Aurora Pumps on a wide variety of war services is your assurance of complete satisfaction as you, too, entrust your exacting pumping requirements to pumps "by Aurora."

We invite you to acquaint yourself with the comprehensive and outstanding line of Aurora Centrifugal and Apco Turbine-Type pumps — a size and type for practically every need in industry.



NSA Aurora Centrifugal Sump Pump

Type OD Hor. Split-Case Double Suction Single Stage Centrifugal

Type AD Hor. Split Case, Two Stage Centrifugal

APCO Horizontal Condensation Return Unit

Type GGU Side Suction Single Stage Centrifugal

APCO Single Stage Turbine-Type

Type GMC Close-Coupled Centrifugal

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AURORA Always PUMPS

AURORA PUMP COMPANY

96 Loucks Street, AURORA, ILLINOIS

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recognition is well deserved. It was in May, 1941, that Farrel-Birmingham was first instructed to proceed with engineering details for the first order of marine reduction gear units to equip C-1A type cargo vessels. Since that date, many orders have been filled for scores of marine propulsion drives for the U. S. Maritime Commission, and throughout these years of production Farrel-Birmingham workers have consistently "beat the schedule."

The award carries with it the privilege of flying the Maritime "M" Pennant and the Victory Fleet Flag, and all employees are entitled to wear the Maritime Badge of Merit.

The company and its employees have received other citations for their contribution to the war effort. The Navy "E", first awarded in March, 1942, has been renewed four successive times since; the display of the Treasury Minute Man Flag indicates over 90 per cent participation in the pay-roll deduction plan for the purchase of war savings bonds.

Formal presentation of the Maritime "M" will be made by a representative of the Maritime Commission as soon as the necessary arrangements can be made.

Second Star for Foxboro's "E" Flag

In a letter, Admiral C. C. Bloch, USN (Ret)., Chairman of the Navy Board for Production Awards, has informed The Foxboro Co., Foxboro, Mass., of its second renewal of the Army-Navy "E" Award "for meritorious service on the production front." The Foxboro Co. manufactures industrial instruments for process measurement and control.

Admiral Bloch's letter reads, in part: "The men and women of your plant have continued to maintain the high standards they set when they were originally awarded the Army-Navy 'E' Flag. The second white star which this renewal adds to your Flag is the symbol of appreciation from our Armed Forces for your continued untiring effort and support, so necessary for Victory."

• BUSINESS CHANGES

Cooper-Bessemer President Elected To Executive Committee of Machinery and Allied Products Institute

Gordon Lefebvre, president of the Cooper-Bessemer Corp., Diesel engine manufacturers at Mt. Vernon, Ohio and Grove City, Pa., has been notified of his election to the executive committee of the Machinery and Allied Products Institute.

Election of the Cooper-Bessemer president was to fill one of five vacancies on the committee while 10 other members succeed themselves, according to the Institute's nominating committee. The executive committee on which Mr. Lefebvre serves is made up of executives from the country's leading machinery builders.

Wickwire Spencer Metallurgical Appoints Evelyn Carlson Sales and Production Coordinator

Wickwire Spencer Metallurgical Corp., subsidiary of the Wickwire Spencer Steel Co., announced today the appointment of Evelyn S. Carlson as Sales and Production Coordinator at the Company's Newark, N. J. plant.

The Wickwire Spencer Metallurgical Corp. is a recently acquired subsidiary, formerly known as Sirian Wire and Contact Com-

Continued on page 38

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IF THE PERFORMANCE of the equipment you build hinges upon accuracy of service adjustments, consider protecting yourself by utilizing Laminum shims in original assembly.

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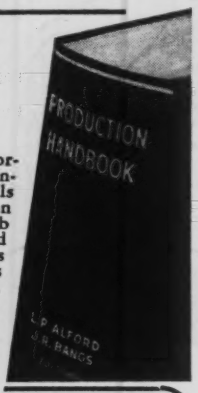
Production Handbook



1700 pages. Covers plant organization, production planning and control, materials handling, time and motion study, plant layout, job evaluation, etc. Packed with new developments and latest applications in outstanding concerns. Board of 90 editors. For everyone in manufacturing. Case examples; hundreds of work ing forms. Flexible binding. **$7.50**

PERSONNEL RELATIONS

By J. E. Walters, Principal, McKinsey & Company. Application of personnel administration in a democracy, presenting viewpoints of labor, management and government as each must recognize them in dealing with the others. Valuable information. **$4.50**

The Industrial Supervisor

By John M. Amiss, Director Industrial Education, Chrysler Corporation; and Traver C. Sutton. Up-to-the-minute guide to improvement of skill and leadership, for all training departments, and for smaller concerns. Based on experience in training thousands of supervisors. **$3.00**

SIMPLIFIED TIME STUDY

By H. J. Myers, Controller, Farnsworth Television & Radio Corp. For every occasion where a supervisor, foreman, shop steward, or cost man can take advantage of time study for his purposes. Clear and simple—anyone can follow the instructions and get results. **$2.50**

Collective Wage Determination

By Z. C. Dickinson. Problems, principles in bargaining, arbitration, and law. Covers adjustments; wages and industrial fluctuations; wage policies in private collective bargaining; influence of public policy on wages. **$5.00**

WAGE INCENTIVE METHODS

By C. W. Lytle. A practical book keyed to the country's greatest production effort. 25 basic plans, with their variations. Tables and charts illustrate performance. Helps you decide the plan for your business. 100 leading companies supplied the data. **$6.00**

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Theodore Lang, Editor. For every man who works with costs—an unequalled fund of information on whole range of cost accounting, organized for immediate application. Contributing editors represent cost experience in every type of manufacturing. **$7.50**

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Business Address.....

City..... State.....

M-9

• Keep Informed . . .

pany. Fine drawn molybdenum and tungsten wires, tungsten carbides and dies, for the electronic industries are manufactured.

Miss Carlson was formerly in charge of Molybdenum Wire Allocation for the War Production Board in Washington, a position she held since 1942. Prior to her Washington post she was assistant to the Technical Director of the Sealed Power Corp., Muskegon, Mich., and in charge of costs and scheduling for the Thomas Foundries, Birmingham, Ala.

In her new position with the Wickwire Spencer Metallurgical Corp., Miss Carlson will be responsible for the coordination of production and sales of both tungsten and molybdenum wire. This Company is currently the largest producer of fine molybdenum wire in the world.

Porter Opens West Coast Office Hintz Named District Manager

To better serve the West Coast territory, H. K. Porter Co., Inc., of Pittsburgh, Pa., and Subsidiaries has opened offices at 849 Petroleum Bldg., Los Angeles 15, Cal., W. W. Calihan, Director of Sales for Porter and Subsidiaries announces. Plans are also in the making for San Francisco offices.

Harold A. Hintz has been appointed district manager for the territory. He is headquartered in the Los Angeles office, where the Company is making available sales-engineering service for the lines of Porter and Porter Process Div.; Mt. Vernon Car Mfg. Co.; Devine Mfg. Co.; Quimby Pump Co.; Fort Pitt Steel Casting Co.; and Porter-Blairsville Co.

Porter "Better Built" products handled for the West Coast thru the new office include locomotives, freight cars, process equipment for oil, chemical and other industries, pumps, electric steel castings and heavy forgings.

Mr. Hintz, who attended University of Chicago in mechanical engineering, began work with Shattuck & Hussey, architects, and Packard Motors Co. In 1925 he established an industrial property management firm, Harold Hintz Co., in Los Angeles, performing his service for many California concerns. Recently he has represented Axelson Mfg. Co., Los Angeles, Cal., as field sales engineer.

Bill Mercer Returns

William B. Mercer is back with Robins Conveyors Inc., again. In the fall of 1942, he was loaned to the War Production Board, Material Handling Division, where he was Chief in charge of the Conveyor and Mechanical Power Transmission Equipment Section.

Now he comes back to our Boston office where he again will handle sales of Robins materials handling machinery, sharing the New England territory with J. F. Donahue who is in charge of Mead-Morrison Division sales.

The entire organization joins in bidding Bill a hearty "Welcome back!"

Porter Names Grotts to New Post as Director of Research and Metallurgy

H. K. Porter Co., Inc., of Pittsburgh, Pa., announces the appointment of Fred Grotts, president of its subsidiary, Fort Pitt Steel Casting Co., to a newly created position, in addition to his present one, as Director of Research and Metallurgy for all Porter plants.

BUYER NO. 3 POPS THE QUESTION

Do loose nut breakdowns lower the trade-in value of *your* vehicles?

More than 1100 operators of 110,000 vehicles said, "YES!" in a recent survey.* They named over 60 trouble centers where loose nuts cut machine life, and 3 out of 4 asked for "a good, all-metal nut that vibration *will not loosen.*"

The Boots Self-Locking Nut meets their exact requirements. In a test on many trucks, twelve months of hard-driving wear and tear couldn't shake it loose from a single connection.

Secured by its built-in lock, it holds with a steel grip. Removed with an ordinary wrench, it can be used again and again without accelerated locking loss. Won't slip in oil, water, chemicals.

Boots Aircraft Nut Corporation, General Offices, New Canaan, Conn.

The ALL-METAL LOCK is Built-in Here

***OPERATORS OF 110,000 MOTOR VEHICLES**

Indicated that if a vibration-proof nut like the above were standard on their post-war equipment, tens of thousands of dollars for maintenance and repairs would be saved.

•

Motion Picture—"All Work And No Play"—16 mm. sound—30 minutes. Write for information Dept. A-24

BOOTS

SELF-LOCKING NUTS

"There's No Excuse for a Nut Shaking Loose"

Representatives in New York, Chicago, Detroit, Indianapolis, Los Angeles, Kansas City, Dallas, Toronto, Montreal, Vancouver

• Keep Informed

In this new capacity, Mr. Grotts will have charge of problems relating to materials of all types, metallurgy, and practices on present products, T. M. Evans, president of Porter, said. He will establish a technical and engineering advisory service for customers on materials and specifications, and direct new product developments.

Mr. Grotts, a national authority on heat treatment of cast steel and cast iron, served in World War I as metallurgical and chemical engineer with Curtiss Aeroplane & Motor Corp. in charge of all technical processes, being cited by United States, Britain and France for his war service.

He later held positions as foundry manager and technical supervisor for Caterpillar Tractor Co.; as wheel plant superintendent for American Steel Foundries; and as director of metallurgical activities for Hubbard Steel Foundry and Wheeling Mold & Foundry Divisions of Continental Roll & Steel Foundry Co.

Under his direction, Fort Pitt Steel Casting Co., of McKeesport, Pa., one of the largest single industrial units producing electric steel castings, received the first award in the nation to an electric steel foundry by the Maritime Commission for outstanding war production, an award that has been three times renewed.

Subsidiary Porter companies for which Mr. Grotts will establish technical process and research services include—besides the parent Company and Fort Pitt—Mt. Vernon Car Mfg. Co., J. P. Devine Mfg. Co., Porter Process Division, Quimby Pump Co., and Porter-Blairsville Co.

Philip Carey Appointments

Three appointments to executive positions in the sales and advertising departments of The Philip Carey Manufacturing Co., producers of building materials and industrial products, have been announced by E. W. (Pat) Smith, Vice President and General Sales Manager.

Harold D. Bates has been named Advertising and Sales Promotion Manager. Mr. Bates has had more than twenty years experience in the promotion of building materials and industrial products and was Assistant Advertising and Sales Promotion Manager for Johns-Manville at New York prior to his present appointment.

Chester L. Owens has been named Assistant General Sales Manager. Mr. Owens joined The Philip Carey Co. as a salesman in 1927 and later served as Branch Manager at Omaha and Chicago. For the past ten years he has been Manager of the Company's Cincinnati Branch.

George B. Johnston who becomes General Merchandising Manager, was formerly Manager of the Marketing Division. In his nineteen years with the Carey organization, he also served in various capacities including Manager of the Contract Department at Louisville and Assistant Branch Manager at Chicago.

All three men will make their headquarters at the Company's Cincinnati Office.

Kennametal Appointments

Kennametal Inc. of Labtrobe, Pa., has added two Field Engineering Representatives to its Philadelphia, Pa. branch personnel, Paul A. Herr, and Harris H. Robbins.

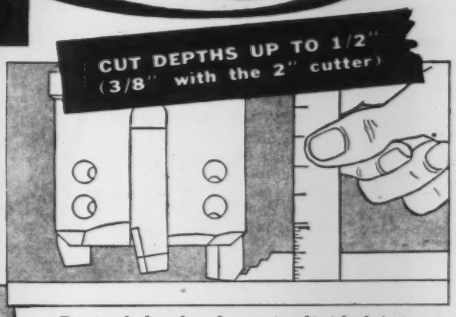
Mr. Herr was until recently a partner of Alfred Stauffer Machine Shops at Honey Brook, Pa., where he had charge of tooling operations. Mr. Robbins, experience embraces eight years with the St. Paul Hydraulic Hoist Co. as machinist, Methods Engineer, and Factory Superintendent.

Continued on page 41

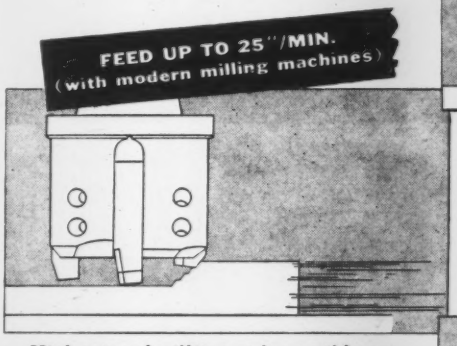
KENNAMILL STEP-CUTTERS

A Simplified Means To Multiply Milling Production with Available Equipment

Kennamills are inserted blade fly-cutters that, in most cases, enable available horsepower to be fully utilized in chip removal.



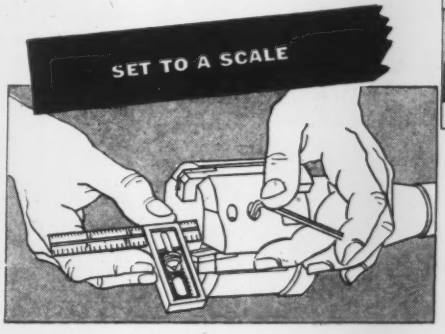
Desired depth of cut is divided into equal steps.



High rates of milling made possible on all commonly used steels.

Blades are resharpened to template on ordinary carbide tool grinder.

Grinding in the head is unnecessary.



Kennamills bring the advantages of high-production carbide milling of steel to every shop that has milling machines of reasonably recent manufacture. They are inexpensive, easy to set-up, and a cinch to maintain. Get in step with modern carbide milling by using this simplified method—write today for catalog information on Kennamills.

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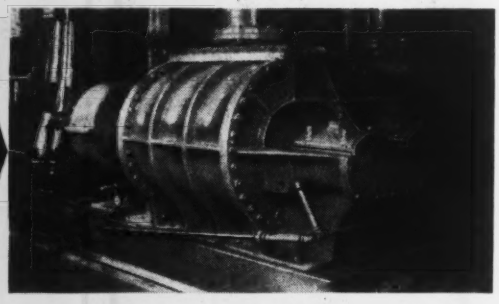
ROTARY POSITIVE BLOWERS AND GAS PUMPS

The ability of "R-C" Positive Displacement Units to maintain top capacities against variable pressures makes them ideal for all gas pumping and boosting operations. Photo shows "R-C" Gas Pump handling wet gas from oil cracking unit. Capacity 3100 c.f.m., 3 lbs. suction pressure.

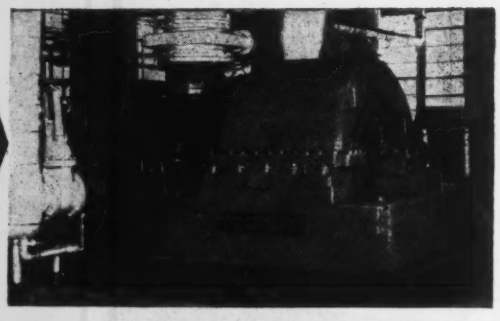
Write for Bulletin 22-23-B-11



CENTRIFUGAL EXHAUSTERS

The consistent high-efficiency performance records of "R-C" Centrifugal Units is definite proof of their superior design and construction. Photo shows 3-stage "R-C" Centrifugal Exhauster installed in a gas utility company. Capacity 20,166 c.f.m., outlet pressure 4 lbs. ga., turbine drive.

Write for Bulletin 120-B-12



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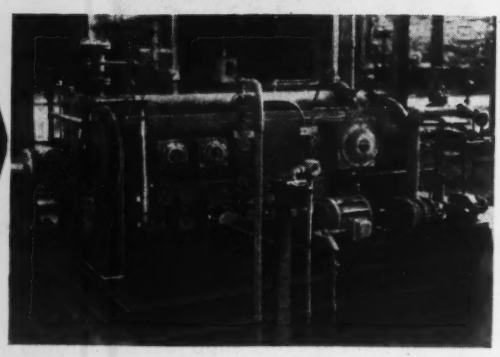
Indispensable for the safe purging of gas holders, processing, and handling equipment. "R-C" Units produce non-explosive inert gas at lowest cost. Unit in photo produces 3000 c.f. hr. of inert gas at 25 lbs. pressure, using gas as fuel. Other sizes from 1000 to 100,000 c.f. hr. portable or stationary types.

Write for Bulletin 100-B-14



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• Keep Informed

Name Greenway Production Engineer

William W. Greenway has been appointed Production Engineer for Mt. Vernon Car Manufacturing Co. and J. P. Devine Manufacturing Co., Divisions of H. K. Porter Co., Inc., of Pittsburgh, Pa.

Prior to coming with these Porter companies, Mr. Greenway had been associated with Austin Western Co. as Production Specialist.

His previous experience includes eight years with LaPlant-Choate Mfg. Co. of Cedar Rapids, Iowa, where he served in various capacities from machine operator to Manager of Production, and one and one-half years as Industrial Specialist with the War Production Board.

Mr. Greenway received his education at Coe College, Cedar Rapids, Iowa.

• LATEST CATALOGS

Scale and Corrosion Control in Engine Jacket Cooling Systems

Operators of internal combustion engines (diesel or gas) and compressors are concerned over the effect of scale and corrosion in engine jacket cooling systems on plant operation and maintenance. The latest information on how these problems are being controlled is contained in two articles appearing in the September issue of "H-O-H Lighthouse," house organ of the D. W. Haering & Co., Inc.

The results of tests by one of the nation's major railroads is covered by one article on Diesel Engine Cooling Water Treatment. The second is a very informative article on "Scale and Corrosion Control in Engine Jacket Cooling Systems" and should be in the library of every operator of water cooled equipment.

A copy of this "Lighthouse" may be had by writing D. W. Haering & Co. Inc., 205 W. Wacker Drive, Chicago 6, Illinois.

New Decarbonator Bulletin

Cochrane publication 2975 is descriptive of Cochrane Decarbonators for removing certain dissolved gases from water solution.

These Decarbonators have been successful in application for removal of carbon dioxide in connection with iron removal plants and with the degasification of hydrogen zeolite softened waters.

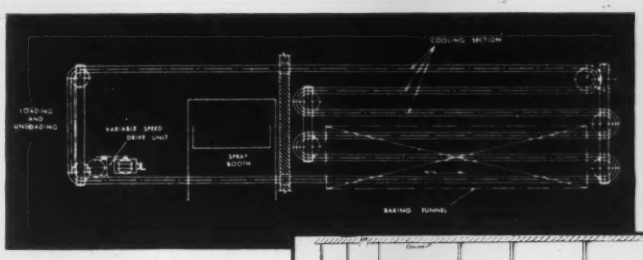
Data is available and description is given of the method of operation and can be had for the asking, by writing to Cochrane Corp., 17th & Allegheny Ave., Philadelphia 32, Pa.

Bakelite and Vinylite Plastics

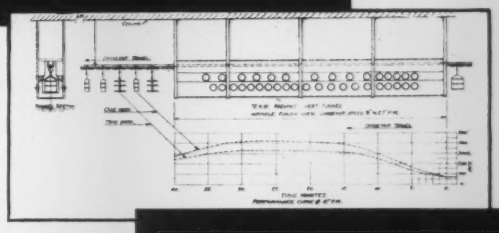
Two new booklets just off the press are available. The first one is entitled "Catalog of Bakelite and Vinylite Plastics." It is published by Bakelite Corp. and the Plastics Division of Carbide and Carbon Chemicals Corp., and contains a complete listing of all the products marketed by these two organizations. Within the 24 pages are descriptions of molding and extrusion compounds; laminating plastics; sheets, sheeting, and film; rods and tubing; cast resins; glues and adhesives; bonding materials; coating products; impregnating, sealing, and calendering materials; and special copolymer resins.

Not only are descriptions of the materials included, but, also, their applications and specific characteristics and properties. In addition to being a catalog of all "Bakelite" and "Vinylite" plastics, this handbook serves as a businessman's guide to both thermoplastic and thermosetting plastics. Copies

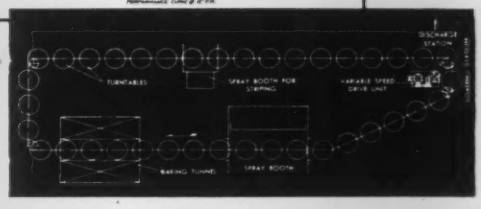
Continued on page 42



Plant No. 1—This G-W coordinated system reduced fuel and power 75%; cut "rejects" up to 30%; saved 50% of former finishing space; reduced operators from 13 to 6.



Plant No. 2—Finishing time reduced by 50%; manpower requirements cut 66⅔% by continuous processing of parts while in transit on G-W conveyor



Plant No. 3—"Rejects" down 35%; power costs cut one-third; paint room space reduced from two floors to one; many individual spray baths and ovens eliminated (and their maintenance) thus releasing employees for other work.

EACH G-W INFRA-RED SYSTEM *DESIGNED FOR ITS SPECIFIC JOB*

If you are to get full advantages of radiant heat baking and drying your infra-red system should be designed to coordinate with other plant operations.

In such a system *planned conveying* is of great importance. From the unfinished product right through the spraying or dipping, baking or drying, and cooling operations up to the shipping platform or warehouse, the conveyor carries great responsibility for profitable operation.

Gifford-Wood brings long experience and "know-how" to the custom-built material handling equipment that it designs, makes and installs. Pioneers in infra-red processes, its engineers specialize in fully coordinated systems for planned conveying. Write for a G-W engineer to call and consult on a system to fit your plant operations, or write for Bulletin M-150.

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HEADQUARTERS FOR INFRA-RED BAKING AND DRYING

are available to business executives upon request, without charge.

The other booklet is entitled "Bakelite Resin Baking Coatings," and is published by Bakelite Corp. This is a 28-page illustrated booklet containing specific information on the properties and characteristics of phenolic resin baking coatings. It includes technical information on the types of surfaces which can be coated with these finishes; methods of application; baking methods and equipment; the properties of "Bakelite" resin baking finishes; and a list of tested and approved applications. This booklet is also available to business executives upon request, without charge.

Flexible Diesel Engine Hose

New Manual #2000 just published by Seamlex Co., 27-27 Jackson Avenue, Long Island City, N. Y.

Containing valuable charts and diagrams, this folder should prove a genuine aid in specifying flexible tubing for diesel engines.

"Technic" of Molding Plastics

"Molding Technic for Bakelite and Vinylte Plastics" authoritative text on plastics molding published by Bakelite Corp., formerly priced at $3.50, is now available at $1.50. This 224-page illustrated handbook discussed important phases of commercial molding processes and equipment. It contains comprehensive data for designer, engineer, molder, and user concerning fabrication and design of hot-set and cold-set molding materials. Special chapters on cost accounting, molding plant layout, and nomenclature are of special interest. Numerous up-to-date tables, diagrams, and illustrations supplement the text. Checks, accompanying orders, should be made payable to Bakelite Corp., 300 Madison Ave., N. Y. 17, N. Y.

Extensive Line of Process Equipment in First Combined Catalog of Porter, Devine & Quimby

Displaying one of the most extensive lines of process equipment in the nation, the first catalog illustrating the combined resources of H. K. Porter Co., Inc., of Pittsburgh, Pa. and its divisions, J. P. Devine Manufacturing Co. and Quimby Pump Co., has just been issued.

Forty different categories of process items, ranging from the smallest agitator to huge process vessels, are listed, with many illustrations, engineering drawings and descriptions of operating principles. A number of recently developed products and improvements to standard lines are described.

Porter Process Division equipment described includes numerous types of mixers, agitators, blenders, ball and pebble mills, kettles and pressure vessels. Under Devine equipment are listed varieties of autoclaves, dryers, fractionating columns, jacketed fittings, heat exchangers, impregnators, pressure vessels, tanks, vacuum pumps, vulcanizers. Screw, rotex, centrifugal and chemical pumps are presented under Quimby products.

The catalog illustrates how the Quimby plants at Newark and New Brunswick, N. J., and the Devine plant at Mt. Vernon, Ill., acquired by Porter in the past two years, have been coordinated with the Porter Process Division plant at Pittsburgh, Pa., into one of the major equipment producers for the chemical, food, oil refinery and paint industries.

Entitled "Porter, Devine, Quimby—The Complete Line of Better Built Equipment for the Process Industries," the catalog is available at Porter's main offices, Oliver Building, Pittsburgh, 22, Pa.

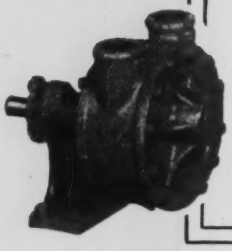
New Link-Belt Worm Gear Speed Reducer Catalog

"A Complete Data Book on Worm Gear Speed Reducers for Industrial Applications" is the title of a new Book No. 1824, which Link-Belt Co. announces has been completed and is now available for distribution to interested readers.

It is a book of 100 pages, replete with photographs, dimensioned line drawings, engineering data, horse power ratings, and tables of weights and dimensions, all aimed at helping the holder of the new book to make his own selection of the type and size of reducer required for a specific service.

In fact, eight pages are devoted to this subject of Worm Gear Reducer Selection. Table No. 1 gives a very useful classification of the various types of service encountered, and gives the proper service factor for each classification, with the variations in this factor according to length of time the reducer is expected to be in service per working day.

Three interesting examples are worked out to show more specifically how to use the data given. Two of the eight pages are Tentative Reducer Selection Tables, not givein in previous Link-Belt books, No. 1524 and No. 1524-B, both of which the new catalog replaces.



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Specify TUTHILL GENERAL-PURPOSE PUMPS for Long, Economical Service

Low first cost and negligible maintenance have made the Tuthill Model C general-purpose pump a stand-by for dependability throughout industry. Simple in design, compact, and built for rugged service, this internal-gear rotary pump is ideal for handling non-corrosive liquids. It operates efficiently in either direction of rotation. Capacities from 1 to 200 g.p.m. at pressures up to 100 p.s.i. Direct-drive, belt drive, V-belt units and stripped models available.

Write for Model C Bulletin.

TUTHILL PUMPS are serving Army • Navy • Air Force Merchant Marine and Industry

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Since 1930, increased production and decreased replacement costs have resulted from the scientific application of the Organic Glucosates to the control of scale and corrosion problems.

Today we are providing control to thirteen times the number of plants served five years ago. Water problems in heat exchangers, boilers, engines, compressors, process and steam piping, condensers, cooling systems, and all other types of water-using equipment respond to the Haering Control system.

Our Technical Department and our Staff of Field Technologists will provide you with a complete survey and interpretation of any scale or corrosion problem in your plant.

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• Keep Informed

It is the first time that horse power ratings have been published, in one volume, on the entire line of Link-Belt single and double reduction, worm and helical-worm gear reducers. These tables, alone, occupy 31 pages of the book. The stock sizes are listed in Bold Face Type.

One page is devoted to the subject of proper lubrication of worm gear reducers Another page covers the Short Housing Bases which are available for standard vertical and wall mounted units.

A copy of new Book Bo. 1824 may be had by writing direct to Link-Belt Co. at Philadelphia, Chicago, San Francisco, or other office of the company.

Giant Size Dates on New Weekly Calendar

With elephant size dates you can see a mile, the new Post 1945 calendar features the fifty-six page weekly pad.

In accord with recommendations from draftsmen and engineers the new calendar has two big advantages over the extremely popular Post 1944 calendar—(1) the giant weekly dates all on one line are larger than ever, easier reading, and (2) large figured previous and following months are shown on each page.

Built on a war week basis the big black numerals can be easily read from any part of the drawing room. The over-all size is $15^3/_4$ x $24^1/_2$.

And this isn't all. A section of technical data for the engineer and draftsman is included, containing charts on wire and sheet metal gauges, screw threads, etc.

Besides its functional value its extreme attractiveness would do justice to any drafting room—printed in six colors.

Enclose a dollar with your request or add your request to an order for any other Post merchandise and the calendar will be furnished free. Address all requests to The Frederick Post Co., Box 803, Chicago 90, Illinois.

New South Bend Lathe Catalog No. 100-D

Featuring twenty-one full color lathe illustrations, this catalog completely describes all South Bend Engine Lathes, Toolroom Lathes, and Precision Turret Lathes. Engine Lathes and Toolroom Lathes are shown in five sizes, ranging from 9″ to 16″ swing. There are two sizes of Precision Turret Lathes; $^1/_2$″ and 1″ collet capacity respectively.

Continued on page 44

Better COMPRESSED AIR After-Cooling

● Keeping moisture out of compressed air is the best way to prevent troubles and damage to pneumatic equipment. Water, condensing in the air lines, wears out and rusts out the vital parts of compressed air tools as well as freezing up air lines and delaying production. In many industrial uses excess moisture or oil in compressed air is also damaging to other materials or products.

The best way to halt such troubles is to use a NIAGARA Aero AFTER COOLER with your air compressor. By evaporative cooling, using atmospheric air as the cooling medium, it obtains lower temperatures and produces compressed air containing only 1/2 to 3/4 as much moisture as air cooled by conventional methods. At the same time it saves cooling water costs, repays its installation cost quickly. It also provides compressor jacket water at controlled temperatures.

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HUMIDIFYING • AIR ENGINEERING EQUIPMENT

• Keep Informed . . .

Complete specifications are listed opposite each lathe illustration giving capacities, speeds, feeds, and dimensions. The balance of the 68 pages (11" x 8½") and 75 illustrations are devoted to construction features of the lathe, lathe tools, and attachments for special classes of work.

Copies of Catalog 100-D can be obtained on request from South Bend Lathe Works, South Bend 22, Indiana.

Characteristics of Acid Regenerated Carbonaceous Zeolites

Cochrane Reprint No. 32 is descriptive of some important theoretical considerations demonstrating characteristics of acid regenerated carbonaceous zeolites. The article summarizes extensive research work when using sulphuric acid as the regenerant and shows the characteristics of various salts, singly and in combination. A paper that is of interest to anyone interested in the theoretical considerations of this unique method of water conditioning, or to those interested in the purchase of this type equipment for boiler feed or process requirements.

Copy of the bulletin is available for the asking, by writing to Cochrane Corp., 17th & Allegheny Ave., Philadelphia 32, Pa.

New Banbury Mixer Bulletin

Farrel-Birmingham Co., Inc., Ansonia, Conn., has released a new 32-page bulletin giving details of the latest developments in Banbury Mixers. ●

The many applications for this money-saving and product-improving machine in the rubber, plastics, linoleum, asphalt, paint, and other fields are discussed. A number of photographs illustrating various sizes and types of machines for different applications are shown.

Features of design and construction are described and a table of sizes, capacities, dimensions' etc., is included. Specific information on installation and operation is given, including a number of helpful drawings showing typical arrangements of Banbury Mixers with auxiliary equipment.

Copies of this new bulletin may be obtained without charge upon request to Farrel-Birmingham Co., Inc., Ansonia, Conn.

"Flexine" Fluxes

Four-page illustrated bulletin gives applications data on 89 different types of "Fluxine" fluxes for brazing, welding, silver and soft soldering practically any type of metal or alloy. Handy chart indicates fluxes, rods and spelters for joining metals. Krembs & Co., Chicago, Ill.

New Temperature Control System

To bring to electrically-heated furnaces, ovens, and similar units as dependable a regulation of temperature as the Position-Adjusting Type of Micromax Electric Control long has brought to fuel-fired furnaces, a new type of M.E.C. has just been announced by Leeds & Northrup Co.

Called "Micromax Electric Control, Duration-Adjusting Type," this system not only regulates electric input to hold temperature at a selected control point or to a program, but is said to hold it there so dependably that users obtain the most efficient balance among product uniformity, speed of output, flexibility of operation.

By means of an "on-off" contacting system, it feeds to the heating unit the electric current needed to keep temperature to the required control point or program. Input is either "full-on" or "full-off". Regulation is obtained by controlling automatically the time during which current is "on" and "off".

Employing the basically-sound balance method both for measurement and control, this new system, like the Position-Adjusting Type of Micromax Electric Control, is a complete coordinated one, engineered to give its users the full benefits of correctly applied control. It provides full proportional *time* action, as compared with the more familiar full proportional *positioning* action. It provides automatic droop-correction. It can be equipped with Overshoot Control, valuable when the furnace or other unit is coming up to temperature.

To obtain more complete information about this Duration-Adjusting Type of M.E.C., for the temperature regulation of electrically-heated units, write Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.

Heat Exchangers

The Heat Transfer division of the Downingtown (Pa.) Iron Works has just published a copyrighted bulletin on Heat Exchangers. Replete with photographs of various types of heat transfer equipment of Downingtown design and fabrication, the book contains mechanical design formulas, line drawing illustrations of construction details and a complete set of tube sheet layout tables.

The publication, printed in two colors, includes a treatise on Evaporators and Freezing Systems, and should prove most instructive to prospective users of heat transfer equipment.

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India Black Ink
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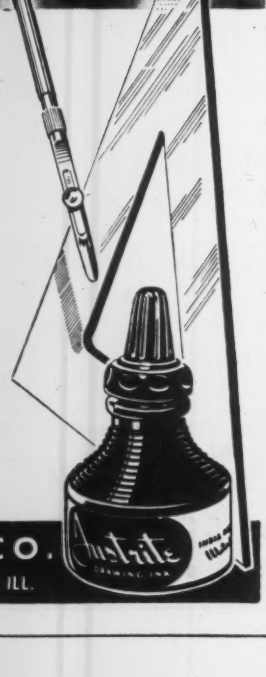
It flows so freely and will not cake in the bottle nor on your drafting pen. It makes superior reproductions. Offered in 23 highly waterproof colors. ¾-ounce quill-stopper bottle 25¢ at your dealers. Also available in larger sizes.



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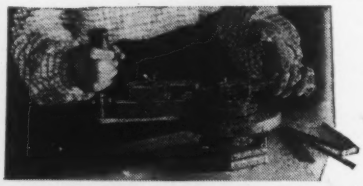
Talk About PRODUCTION Without DIES!

4,000 Parts Per Day with DI-ACRO Bender

"Enclosed are pictures taken in our plant which prove the DI-ACRO Bender will do a real production job. We are making 4,000 completed parts per day which is competitive to most Power Presses." (Name on request.)

Here is an example of "DIE-LESS DUPLICATING" typical of a great variety of formed parts readily made with DI-ACRO Precision Machines,—Benders, Brakes, Shears. Picture below shows an acute right angle bend and photograph above shows the finished part formed to die precision. Women operating DI-ACRO UNITS maintain a high out-put on production work.



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- *NEW EQUIPMENT*
- *BUSINESS CHANGES*
- *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

Light Weight and Low Cost Feature New Lincoln Electrode Holder

A new holder for welding electrodes, said to be lighter (22 ounces) and lower in cost ($2.50) than other insulated holders of equivalent capacity, has been announced by The Lincoln Electric Co., Cleveland, Ohio, world's largest producers of arc welding equipment.

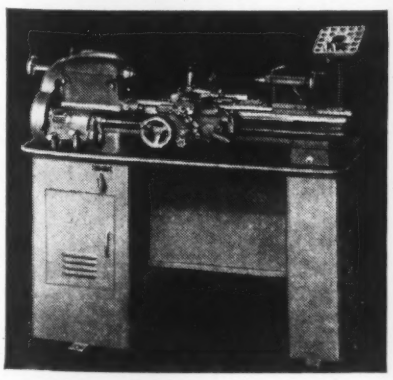
Having a current rating of 300 amperes with ample capacity for overload, the new holder will handle various sizes of electrodes ranging from 1/16-inch diameter to 1/4-inch diameter inclusive.

Jaws, made of high conducting and wear-resisting copper alloy known as "Lincalloy", will withstand rough treatment and are fully guarded from contacting the work by durable spring steel insulating guard that is easily replaceable. The trigger of the holder is of molded, heat-resisting inorganic material.

Other features of this new type "INS" electrode holder include: hollow, air-cooled, heat-resisting fibre handle, excellent balance and equally good performance on both AC and DC current. The holder is designed to hold the electrode securely at any angle yet permit quick and easy change of rods.

New South Bend 9-Inch Toolroom Lathe

A new 9-inch Toolroom Lathe for exacting toolroom or production operations has just been announced by the South Bend Lathe Works. This lathe has a 9 1/4" swing and takes 22" between centers. It has a maximum collet capacity of 1/2" and a 3/4" spindle bore.

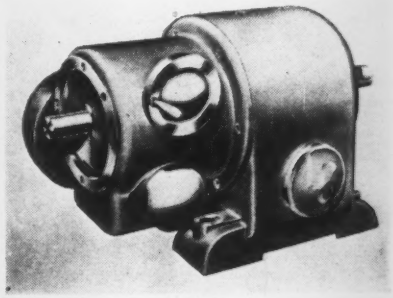


The 12 spindle speeds range from 41 to 1270 r.p.m., with back-gear drive for the lower speeds. A quick change gear box permits cutting 48 pitches of screw threads, 4 to 224 per inch; and provides 48 power longitudinal feeds and power cross-feeds. The lathe is equipped with a handwheel draw-in collet attachment, collet rack, taper attachment, thread dial indicator, thread cutting stop, large and small face plates, and micrometer carriage stop. Additional attachments are available which simplify the machining of special classes of work.

Complete information on this lathe can be obtained by writing to the South Bend Lathe Works, 385 E. Madison St., South Bend 22, Indiana.

New Variable Speed Drive Has Important Job in Postwar Planning

With the new emphasis placed on selective production speeds and on rapid transportation of goods and products in all types of work, the announcement of a compact new type variable speed drive developed by Lombard Governor Corp. of Ashland, Mass., points to new possibilities particularly in the medium and higher horsepower fields, for quick, sure control of line conveyor and production machinery.



The importance and convenience of an individually-controlled drive is readily understood. Universally adaptable for modernization of old equipment as well as for installation on new equipment, this streamlined variable speed transmission is being used in many new fields of application hitherto impossible to gear drives. Accompanying illustration shows the compact design and graphically presents the advantages of this long awaited improvement in the field of transmission of power.

Its compactness particularly recommends it—for it is scarcely larger than the motor with which it is used—even in the higher horsepowers, 15, 25, 50, 100 hp. or higher. The complete unit with the motor has the size and appearance of two standard AC motors coupled together—a saving of space which is a considerable factor. Weighing not much more than the motor which drives it, the Lombard Variable Speed Drive assures ease of handling and installation. Long life is assured as the gears are helical, hardened with frictionless bearings and totally enclosed and run in oil. This factor also reduces noise, and eliminates the possibility of dirt, grit, and moisture getting into the gears, while at the same time practically eliminating the maintenance.

Differing from conventional types of variable speed units, the Lombard Variable Speed Drive uses a V-Belt as a control medium only, power being transmitted by conventional gearing methods. This device is positive in action, without slip. The lower gear ratio also affords finer hairline control. The efficiency at low speeds is higher than the efficiencies usually attained. Having the variable speed output shaft concentric with the motor shaft gives it the advantage of a direct line drive. Remote control is also available. Horizontally split casings simplify maintenance.

As a result of this new engineering approach, old limits of space and horsepower are discarded and entirely new fields of application are available to designers and builders of machinery, as well as to plant production executives who are utilizing the many advantages of this new speed transmission in their plant improvement and reconversion programs.

New Blackmer Gathering Pump Unit for Oil Fields

A new pumping unit, designed and built by Blackmer for use in the oil fields as a gathering pump has just been announced by J. B. Trotman, General Sales Manager of the Blackmer Pump Co., Grand Rapids, Mich.

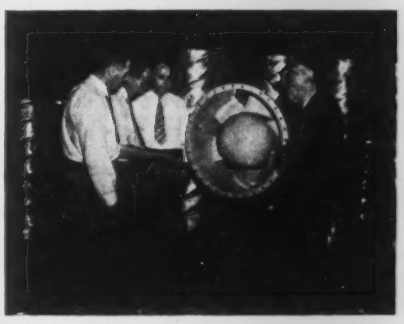
The specifications of the new unit are as follows: Capacity, 50 GPM; Pressures to 500 psi.; Mechanical efficiency at 500 psi 70%; Suitable for suction pressures from 0 to 100 psi; Will handle crude oils of viscosities from 40 SSU to 200 SSU—Specific gravity .82; Power—25 HP gasoline engine, mounted on common fabricated steel skid with pump, reduction gearing and clutch.

The pump is equipped with special anti-friction bearings. The stuffing box is so designed that vacuum is maintained on the packing chamber thus reducing leakage to an absolute minimum.

Mr. Trotman states that a similar unit of 90 GPM is now about ready for production and will soon be available.

Extra "Air Force" for Navy

Center of attraction is the 25,000 Axial Flow Fan produced for the Navy by the LaDel Conveyor & Manufacturing Co., of New Philadelphia, Ohio. Plant Supt. T. O. Adams (second from left) is explaining new operational, construction and production advantages to (left to right) LaDel's General Manager L. A. Schwab, Sales Manager G. R. Whitnall and President Iver Harris.



New standards of fan performance, and new production records, are typified by the 25,000 Axial Flow Fan (pictured above) just "off the lines" at the LaDel Conveyor & Manufacturing Co., of New Philadelphia, Ohio.

Continued on page 29

Molybdenum cast steels make tough, wear-resistant parts. Our data on practical analyses are always available.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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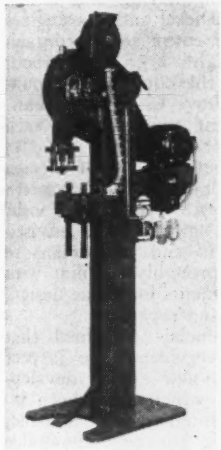
• Keep Informed

In addition to the thousands of fixed pitch Axial Flow Fans (5,000 to 50,000 cfm capacity) now serving around the world with the U. S. Navy and Merchant Marine, LaDel is specializing in their exclusive adjustable pitch blade Axial Flow Fans for our greatest fighting ships, including the new super destroyers and giant aircraft carriers. In fact, LaDel's entire fan production is mobilized to supply the Armed Forces.

Even before Pearl Harbor, LaDel pioneered the Axial Flow principle in the mine ventilating field, and the moment production facilities are released by the government, today's new operational, construction and production advantages are ready for adaptation in a wide variety of fields.

Tomkins-Johnson Machine Rivets Pail Ears



Three operations are performed at one stroke of the ram with this electrically-powered T-J "Rivitor," specially adapted to the job of piercing, dimpling and riveting bail ears on pails, using 1¾ lb. tinners rivets. The "Rivitor" is manufactured by the Tomkins-Johnson Co., Jackson, Mich.

Rivets are underfed by the machine, as on a standard underfeed "Rivitor." The unpierced pail and ear are placed over the rivet and properly located by gages.

When the "Rivitor" ram descends, a combination piercing and dimpling die mounted on a spring-actuated pressure pad attached to the ram forces the work over the rivet, piercing and forming a dimple in the pail and ear.

The dimple is deep enough to prevent the manufactured head of the rivet from projecting inside the pail. At the end of the down stroke of the "Rivitor", the rivet set (not visible in the photograph because of the pressure pad) forms a slightly rounded head on the rivet.

The company also manufacturers air-powered "Rivitors" for aircraft riveting; air and hydraulic cylinders, clinchors, die sinking milling cutters and air controls.

York Plans Simplified Line of Cooling Products

Philadelphia, Pa.—A streamlined program for postwar product development and redesign will make possible a reduction as high as 25 per cent in the number of refrigeration and air conditioning items manufactured by the York Corp., one of the nation's major producers of such equipment, it was reported here recently.

Speaking before a meeting of the Sales Managers Association of Philadelphia, W. S. Stair, director of product development for the company, declared that one of the major postwar problems of the refrigeration and air conditioning industry at present is that of simplification and reduction in number of types and sizes of equipment without loss of either markets or potential applications.

"There are some 50 major markets for our products and in order to cover these markets

Continued on page 30

WARTIME SERVICE HAS BEEN *TOUGH* ON VALVES

but not too tough for LUNKENHEIMER

Built-in quality

With production geared to tremendous volume, valves have taken a real beating during the war. It's been a gruelling test . . . of quality . . . of ability to *stay tight* under all service conditions.

In this severest of tests, Lunkenheimer Valves have proved their worth by giving consistent maximum service with a minimum of trouble and maintenance expense.

Simplicity of design and engineering "know how" are responsible for the exceptional record established by Lunkenheimer Valves on every wartime front—industrial and military.

In coming peacetime, as during the past three-quarters of a century, a solid assurance of top economy and performance lies in Lunkenheimer built-in *lasting* quality.

Lunkenheimer Distributors too have measured up to a tough assignment... to keep their vitally needed service channels open despite almost insurmountable handicaps. The facilities of this nationwide organization are at your service always.

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BRONZE, IRON, STEEL AND CORROSION RESISTANT ALLOY VALVES, 125 TO 2500 LB. S.P.; BOILER MOUNTINGS, LUBRICATING DEVICES, AIRCRAFT FITTINGS

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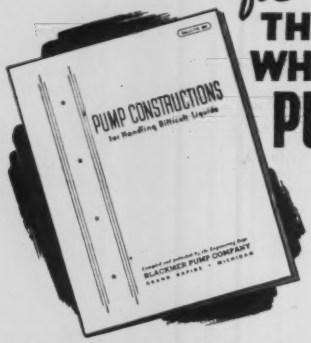
REFERENCE BOOK
for
THOSE WHO USE PUMPS



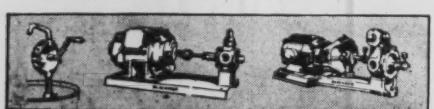
★

•Contains authoritative data on recommended metals for the construction of pumps for handling difficult liquids.

FREE TO ENGINEERS

BLACKMER PUMP CO.

1920 Century Avenue, Grand Rapids 9, Mich.



BLACKMER Rotary PUMPS
BUCKET DESIGN—SELF-ADJUSTING FOR WEAR

• Keep Informed . . .

we build 55 different classes of commodities which, when broken down in various sizes, represent 400 different items, not including parts," Mr. Stair explained. The present policy, he said, is centered on establishing a list of postwar commodities which will include some of York's present products without change, others of the present line redesigned for lower costs, better performance and standardization and a certain group of entirely new products.

Mr. Stair pointed out that for the past year all product development operations previously handled by several different departments are now centered in one group reporting directly to the president. This group, in addition to handling product development, studies markets and marketing methods, consumer needs and acceptance and joint developments with outside manufacturers. The latter activity, he added, is aimed at finding wider application of York equipment in packaged merchandise produced by other manufacturers.

"As in other industries," the York executive said, "it may appear that considerable work could be done by our development engineers on certain doubtful projects which would eventually go for naught due to subsequent market studies which would make it advisable to drop a project. However, our present schedule is remarkably free from this penalty for the reason that aside from redesign it is largely devoted to component parts rather than completed packages.

"Practically every refrigeration or air conditioning system or unit which we build incorporates some type of gas pumping means and heat transfer surface. This is true whether it be a small portable air conditioner or a refrigerating system for a vast cold storage plant. Therefore, while our development engineers have been striving for more compact, efficient and lower cost component parts which may find use in a wide variety of unitary equipment, we have been conducting market studies which will help us to make a final decision to incorporate these components into finished models and make capital expenditures for tools and plant alterations as may be found necessary."

Field Servicemen Study Latest Engine Developments at Cooper-Bessemer Plants

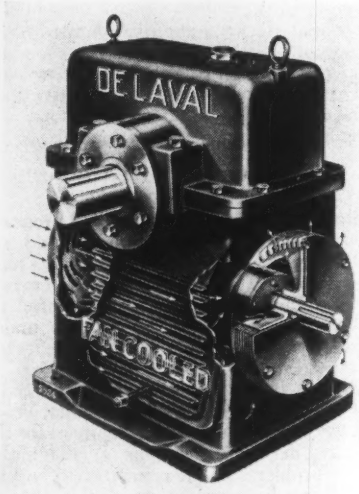
In order to provide field servicemen of The Cooper-Bessemer Corp. with up-to-the-minute information on the latest developments in the engineering and manufacture of the firm's Diesel and gas engines and compressors, the entire service organization has been brought, a group of about fifteen at a time, to the company's Mount Vernon, Ohio, and Grove City, Pa., plants. Each group has spent two days at each Cooper-Bessemer plant.

The field service crew consists of 63 men representing 15 branch offices of the concern throughout the country. During their visit, the servicemen were guided and advised by company engineers and technicians so that they became thoroughly familiar with all the latest advancements in engine design, erection, installation and repairs.

Cooper-Bessemer officials explained that by permitting their servicemen to inspect and study the many new engine developments, a number of which have been influenced by unprecedented wartime demand, the servicemen added to their knowledge and become even better equipped to serve the company's thousands of marine and industrial users.

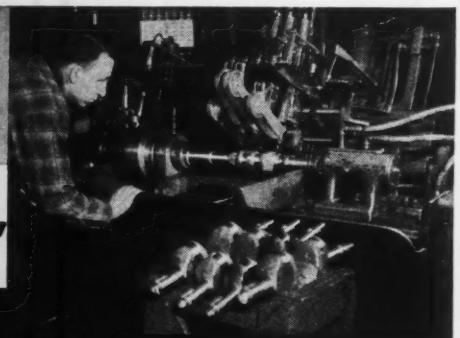
De Laval Announces New Fan-Cooled Worm Gear

Heretofore, the capacity of worm gear speed reducers, operating at high speeds, has been limited not by the strength of materials, but by the ability of the casing to liberate heat which otherwise raises the temperature of the oil and breaks down the film of lubrication between worm and gear.

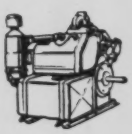


Forced air-cooling, as employed in the new De Laval Fan-Cooled unit, removes the heat so effectively that the capacity of the gear is doubled for practically all ratios and sizes at 1750 r.p.m. This permits the use of

SUPERFINISHED CRANKSHAFTS



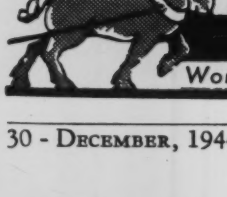
another "PLUS FEATURE"
IN ALL
WISCONSIN Air-Cooled ENGINES



The very ingenious, specially designed machine illustrated above, puts a mirror-smooth *superfinish* on the crank-pins of all Wisconsin Air-Cooled Engines. By combining perfectly synchronized rotating and oscillating polishing movements, absolutely uniform diameter is maintained over the full length of the crankshaft bearing surfaces.

This is just another of the many small, but *important production details* that account for Wisconsin heavy-duty serviceability and smooth, efficient operation. Just another reason, too, why *your equipment* should be powered by a Wisconsin engine.

Most H.P. per pound



WISCONSIN MOTOR
Corporation
MILWAUKEE 14, WISCONSIN, U. S. A.
World's Largest Builders of Heavy-Duty Air-Cooled Engines

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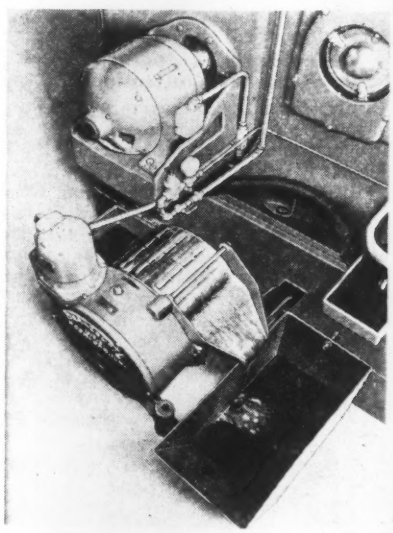
smaller, lighter and less expensive speed reducers, without sacrifice of efficiency or durability.

As can be seen from the illustration, a fan mounted on the worm shaft draws air at high velocity over and around heat dissipating ribs upon the air side of the oil reservoir housing the gearing. The use of a double wall greatly increases the effectiveness of the cooling by confining the cooling air to the housing and thus securing the close air-to-metal contact necessary for maximum heat transfer.

A complete line of De Laval Fan-Cooled Worm Gear Speed Reducers will soon be available. If you wish to be placed upon our mailing list for literature describing these units, write to the De Laval Steam Turbine Co., Trenton 2, N. J.

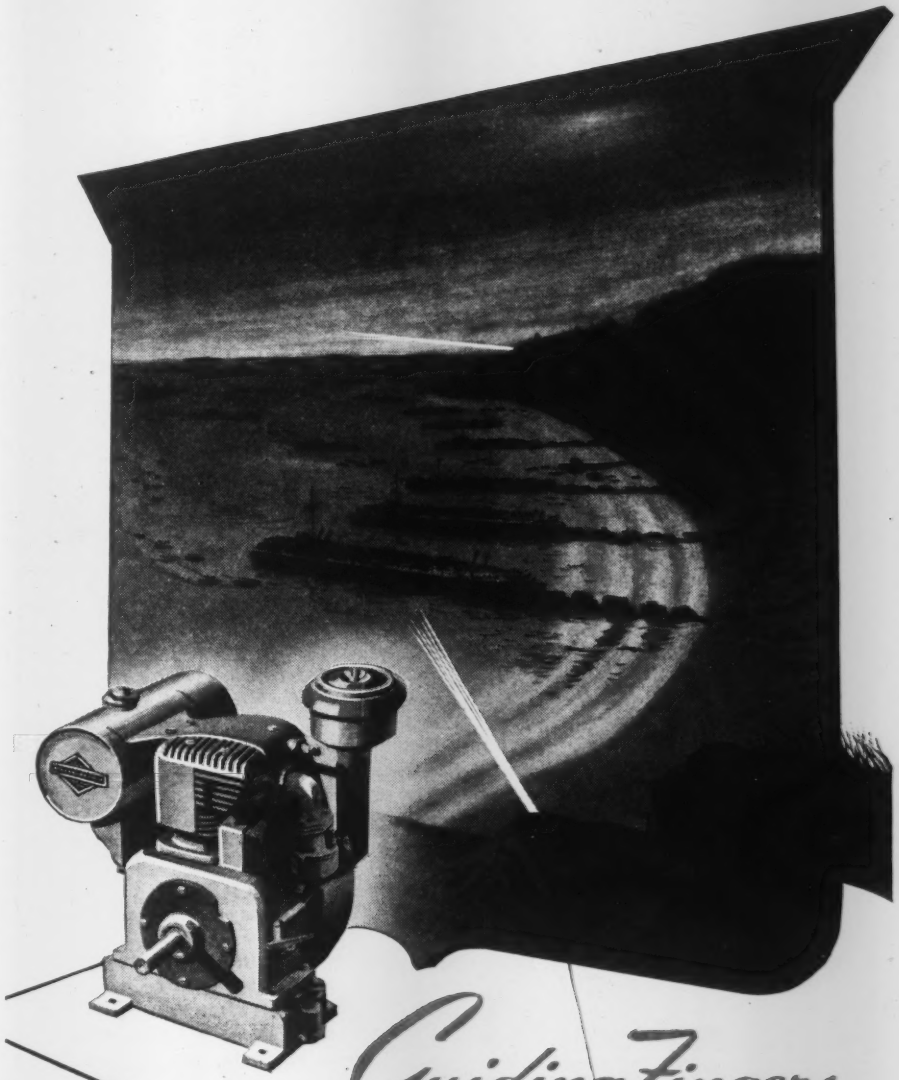
"BarnesdriL" Magnetic-Automatic Coolant Separator

The Magnetic-Automatic Coolant Separator brought out by the Barnes Drill Co. of Rockford, Ill. embodies an entirely new and revolutionary method for automatically removing harmful metal and abrasive particles from honing coolants having a non-soluble base. The outstanding feature of the new "BarnesdriL" Separator is its automatic operation, which reduces maintenance to a minimum and allows the operator to devote full time to productive work. Time formerly spent cleaning and changing filters of costly filtering equipment is saved, since there are no filters employed by the "BarnesdriL" Separator and all swarf and magnetic particles are automatically removed through magnetic attraction. Operator can observe drum to determine stock removal. Continuous or intermittent operation is easily achieved with little attention on the part of the operator, who simply starts or stops the Separator motor.



The "BarnesdriL" Magnetic-Automatic Chip Separator is a self-contained, motor driven unit, employing a magnetic rotary drum, which attracts metallic particles as they pass through the coolant and carries them out as the drum rotates. The drum is constructed of a series of permanent magnets mounted all the way around the inside and rotating with it. The coolant flows rapidly in a thin wide channel through the lower part of the Separator in a counter direction to the slow rotation of the drum; the metal and abrasive particles form on the drum and extend on end in a definite brush-like pattern. Then, as the drum rotates, the entire sludge

Continued on page 32



Guiding Fingers of Light

From newly established positions, portable beacon units guide and warn supporting ships and aircraft. Their electric generating plants are powered by rugged, quick-starting Briggs & Stratton engines — another one of many vital war services by hundreds of thousands of Briggs & Stratton engines.

Air-Cooled Power

4 CYCLE BRIGGS & STRATTON GASOLINE ENGINES

BRIGGS & STRATTON leadership in design, engineering and precision manufacture is backed by the performance record of more than TWO MILLION Briggs & Stratton engines—and a quarter-century of *continuous* production of *"air-cooled power."* You can profit by this experience in your plans for the future—whether you manufacture, sell or use gasoline-powered equipment or appliances. BRIGGS & STRATTON CORP., Milwaukee 1, Wisconsin, U. S. A.

Inserts of WEAR-RESISTANT KENNAMETAL CAN OFTEN SALVAGE EXPENSIVE PARTS . . .

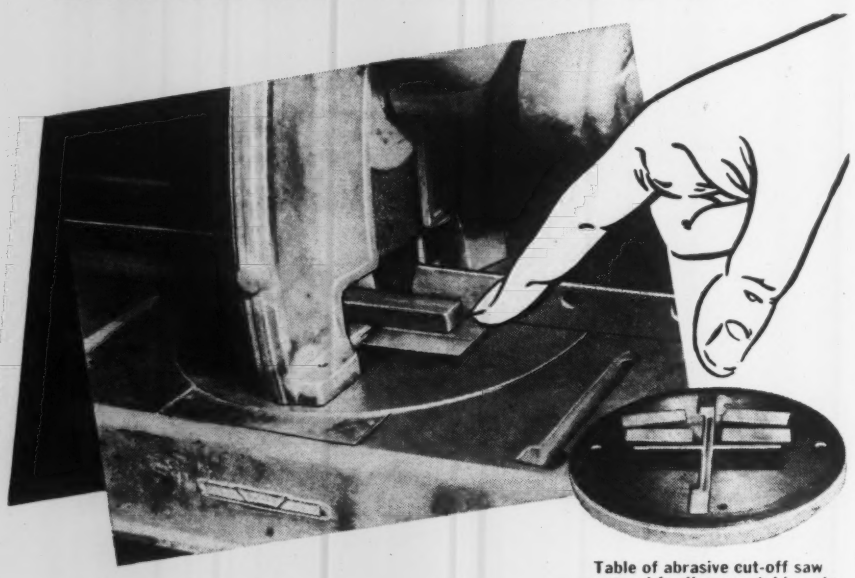


Table of abrasive cut-off saw recessed for Kennametal inserts

. . . AND PROVIDE A NEW SURFACE THAT OUTWEARS THE ORIGINAL UP TO 100 TIMES

The effective life of many types of machines can be lengthened, and costly shutdowns eliminated, by using Kennametal at strategic points. The illustrations of the abrasive cut-off saw clearly show how standard Kennametal blanks, made primarily for cutting tools, can be used as wear-resistance units. The original surfaces of the saw rest wore quickly, allowing the steel to wobble, causing uneven cut-off. Kennametal inserts, recessed into the table, make a smooth, hard surface of unsurpassed durability.

● The superiority of Kennametal for "specialty" applications comes from a combination of unique properties —amazing hardness (78 Rockwell C), low coefficient of friction, high modulus of elasticity (2 to 3 times that of steel), dimensional stability, and resistance to corrosion and erosion.

Kennametal is available in standard shapes (flat blanks, discs, balls), or it can be accurately molded into special shapes, limited only by reasonable proportions. You can use it profitably in your products, and production machinery. Tell us your wear problem. We will suggest how it may be solved with Kennametal.

KENNAMETAL
SUPERIOR CEMENTED CARBIDES
KENNAMETAL Inc., LATROBE, PA.

• Keep Informed

mass is scraped off and discharged through a chute into a movable pan. Constant swarf removal maintains reservoir storage. There is no temperature rise and the coolant returns to the reservoir into the base of the machine, ready for immediate recycling. This cycle is entirely automatic and assures efficient, carefree operation. Cleaned coolant results in a higher degree of finish.

Where gravity feed of the coolant from the machine to the Separator is impracticable, a motor driven pump may be used for transferring the used coolant into the Separator. After the coolant is cleansed, it is carried by gravitation from the Separator into the cleaned coolant reservoir.

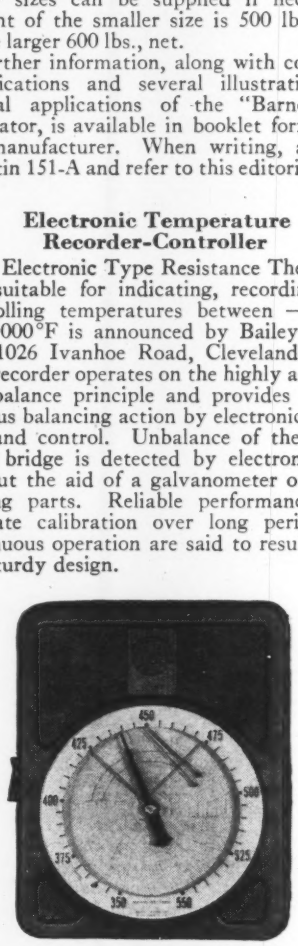
The "BarnesdriL" Separator is easily installed and can be successfully applied to use on Honing Machines of both vertical and horizontal types. It may also be used on grinding machines when a soluble solution is used as the coolant. May also be used on other types of machines where minute particles of magnetic material are suspended in the flow of coolant. The low initial and maintenance costs have already established the "BarnesdriL" Separator as the best and most economical means for keeping honing coolant free of harmful, minute chips.

Two sizes of the "BarnesdriL" Magnetic-Automatic Separator, both employing a ¼ h.p. motor are now available. The capacity of the smaller Separator is 10 gallons of coolant per minute, while the larger size is capable of handling 20 gallons per minute. Other sizes can be supplied if necessary. Weight of the smaller size is 500 lbs., net; of the larger 600 lbs., net.

Further information, along with complete specifications and several illustrations of typical applications of the "BarnesdriL" Separator, is available in booklet form from the manufacturer. When writing, ask for Bulletin 151-A and refer to this editorial.

Electronic Temperature Recorder-Controller

An Electronic Type Resistance Thermometer suitable for indicating, recording and controlling temperatures between —100°F and 1000°F is announced by Bailey Meter Co., 1026 Ivanhoe Road, Cleveland, Ohio. This recorder operates on the highly accurate null balance principle and provides instantaneous balancing action by electronic detection and control. Unbalance of the measuring bridge is detected by electron tubes without the aid of a galvanometer or other moving parts. Reliable performance and accurate calibration over long periods of continuous operation are said to result from this sturdy design.



The recorder-controller illustrated above indicates, records and controls temperature. A 29-inch indicating scale which circles the chart may be read easily at a distance of 50

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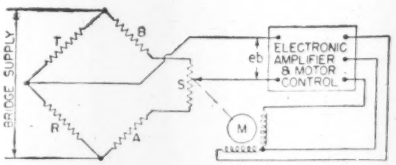
feet." The pointer reading coincides with that of the recording pen. Indicating, recording and controlling mechanisms are all driven by the same reversible electric motor which adjusts the slidewire resistance to balance the measuring bridge. This motor is continuously connected to the electronic control unit which in turn is continuously connected to the measuring bridge as shown below.



T=TEMPERATURE SENSITIVE PLATINUM RESISTANCE
A,B & R=FIXED RESISTORS M=SLIDEWIRE DRIVE MOTOR
S=SLIDEWIRE

Bailey Electronic Resistance Thermometers may be provided with as many as four recording pens, each one being provided with its own continuously connected electronic control unit and measuring bridge. This feature insures instantaneous response to changes in temperature.

The temperature sensitive element is a platinum resistance wire, wound on a mica form and held between two mica sheets which are clamped by a metal frame. The element is further protected by a well which is permanently installed in the pipe line, furnace wall, duct, or other point of temperature measurement. The temperature element is diagrammatically represented in Fig. 2 by the resistor T. Resistors R, A and B are fixed and are designed to provide proper range of measurement. Adjustment of the slidewire contact on the resistor S subtracts resistance from A and adds resistance to B or vice versa. Thus, the bridge is balanced by adjusting the ratio of the bridge arms and the necessity of carrying bridge current through the slidewire contact is avoided. Variations in contact resistance are thus prevented from effecting calibration.

Since alternating current is used for the bridge, no battery source of bridge voltage is needed. Standard voltage cells and voltage standardization equipment are not required.

Bailey Air-operated Control, Electronic Control or contacts for on-off electric control may be provided for as many as two temperatures by the multiple pen Bailey Electronic Recorder-Controller. The control mechanisms required are mounted inside the recorder-controller casing and are actuated by the same reversible motors which drive the recording pens.

Alarm contacts may be provided for any or all of the recorder units. These contacts are operated by an adjustable cam which may be set to trip at any desired position of the recording pen.

Temperature measuring circuits may be arranged to calculate the sum, difference and ratio of temperatures. Calculated results are recorded directly by Bailey Electronic Type Recorders in the form of news instead of history. Much time and labor may be saved by the electronic calculating method as compared with manual calculation from chart records and log sheets.

New Blackmer Low-Capacity Pump

Final laboratory and field tests have been completed on a new direct connected small capacity rotary pump designed and built at the Blackmer Pump Co. plant in Grand Rapids, Michigan. J. B. Trotman, General Sales Manager of the company states that the new unit is now in production.

Continued on page 34

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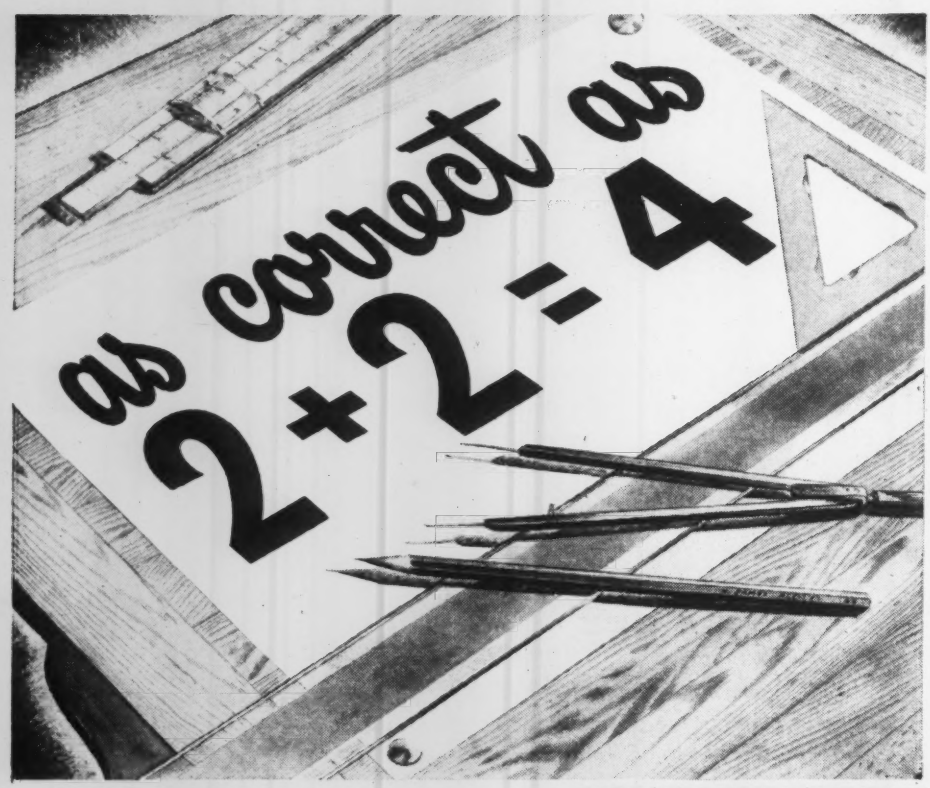
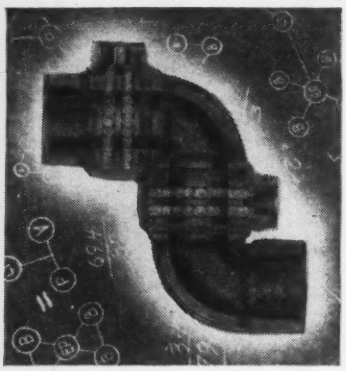
AMERICA'S STANDARD FOR OVER 20 YEARS



CHIKSAN FORMULA FOR A PERFECT SWIVEL JOINT...



$$BB_2 + EP = \frac{LT}{P/V}$$

BB_2 = **Double rows of Ball Bearings** — For easy turning with minimum friction. They also maintain perfect alignment of moving parts.

EP = **Effective Pack-Off** — This self-adjusting unit permits the use of the same Swivel Joint for all services. Nothing to tighten or adjust.

LT = **Low Torque** — No excessive friction drag because turning takes place on ball bearings which hold moving members together. Tightness of Joint does not depend upon compressing packing element by means of bolted flanges, thereby causing joint to stick.

P/V= **Pressure or Vacuum** — Pre-determined pressure on Packing Ring prevents leaks due to pressure or vacuum. Packing automatically adjusts itself to either service.

These are the essential elements for perfect swivel action. You get ALL of them when you specify Chiksan Ball-Bearing Swivel Joints.

ARMY NAVY

WRITE FOR CATALOG AND ENGINEERING DATA

CHIKSAN TRADE MARK REG.

CHIKSAN TOOL COMPANY

Ball Bearing SWIVEL JOINTS for ALL PURPOSES

BREA, CALIFORNIA

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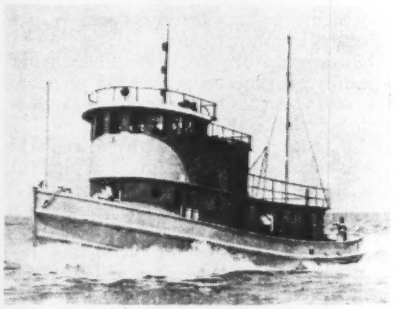
The specifications are as follows: Capacity, ½ GPM; Discharge pressure 100 psi; Direct connected by a flexible coupling to an 1800 RPM motor. Overall dimensions: Length 11¾", width 5⅜", height 5", weight 15¾ lbs.

Built-in relief valves are optional and the units are available for belt drive, as a pump only, or the rotating elements may be supplied where the pump is installed as an integral part of a machine.

Due to the special "bucket design", these pumps are self-adjusting for wear, maintaining normal capacity throughout the life of the buckets, which are easily replaced when worn out.

Features of New Diesel Tug Reflect Progress in Work Boat Design

Notable advancements incorporated in a new twin-screw tug, will have a far-reaching influence on what to expect in work boat design after the war, according to marine engineering authorities of The Cooper-Bessemer Corp., engine builders of Mount Vernon, Ohio, and Grove City, Pa.



The many advancements pointed out by F. B. Walker & Sons, builders of this 93-foot, all welded tugboat, included an extremely shallow draft, patented steering gear operated by compressed air, twin screws and rudders, and special valving of general-purpose and bilge water pumps for service in case of emergency.

The boat, originally named the "Walker No. 8," was designed and built to serve in the Walker Barge Line. Like many other craft, of both pleasure and commercial types, she was recently requisitioned by the War Shipping Administration for United States naval duty and re-named the "Falcs."

Powered by two Cooper-Bessemer Type JS Diesel engines of 500 horsepower each at 400 revolutions per minute, the "Falcs" has already set an enviable performance record since its launching several months ago at Pascagoula, Miss.

For example, when fully loaded with 22,000 gallons of fuel, the tug's draft is only 8½ feet as compared to nearly twice that draft for boats of similar size and weight. Thus, many more ports and waters are accessible to the "Falcs" than are possible with boats drawing ten feet or more.

Its twin screws and rudders, along with her direct reversing, 6 cylinder Diesels, permit exceptional maneuverability needed for navigating crowded and narrow channels.

The trend in advanced design for tugboats is further exemplified by the "Falcs" auxiliary equipment and modern appointments. The electrical installation is composed of two 20 kilowatt, Diesel driven generators supplemented by sufficient storage battery power for stand-by service.

The galley range and latest type hot water heating system both use the craft's Diesel oil as fuel. Other appointments include first class crew quarters with tile shower bath, airhorn signal equipment and engine room telegraph system.

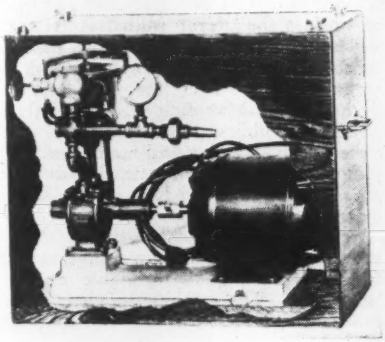
• Keep Informed

Although Cooper-Bessemer's production is now largely geared to Army, Navy, Coast Guard and industrial power requirements, officials of this veteran manufacturer of Diesel and gas engine and compressors are convinced that Diesel tugs of this general design will continue in great demand for both ocean and river service.

Light Weight Carrying Units for Air or Gas Testing or Spot Jobs

There are many occasions when we might wish we had one of our production machines, reduced to carrying size, which we might use for doing a job—right on the job—and doing it with production machine efficiency.

To have such a machine would mean a better job done, and much time, ordinarily frittered away while trying to improvise another means of handling a difficult situation, could be saved.



Leiman Bros., after giving much thought to the matter of portable machines, are now furnishing an easily carried vacuum and pressure unit for gas or air, to be used in operating many kinds of apparatus for temporary use or for test purposes.

These portable units will handle from 1 up to perhaps 5 cubic feet of air and at a pressure up to perhaps 10 lbs. or 20 inches mercury vacuum, and any purpose for which air or even non-corrosive gas might be used may be very readily accomplished with these light weight units.

Units of this kind may be made probably as light as 10 or 20 lbs. in weight, which makes them very handy, even for permanent as well as temporary installation, as they may be furnished as small as about 6 × 10 inches and probably as low in height as 6 to 8 inches.

The units may be equipped with interchangeable motors for various currents found in different sections, and while some are direct connected to the motor shaft, others are operated with equally restricted drives in the form of V belts and grooved pulleys.

A very convenient carrying case is supplied, and there are means of controlling the flow of air to or from the pump and at the same time controlling the degree of pressure or vacuum.

Leiman Bros., Inc., 118–77 Christie St., Newark 5, N. J., will be glad to give you full information, if you will send them full particulars of any use for a portable outfit of this kind you may have in mind.

G. E. Announces New High Tensile Electrode for Arc Welding Aircraft Steels

A new high tensile arc welding electrode for fabricating aircraft steels has been announced by the Electric Welding Division of the General Electric Co. Capable of making a deposit of high tensile strength

Continued on page 36

How Amsco Met Requirements for Easy Machining Non-Magnetic Alloy Parts. . . . . .

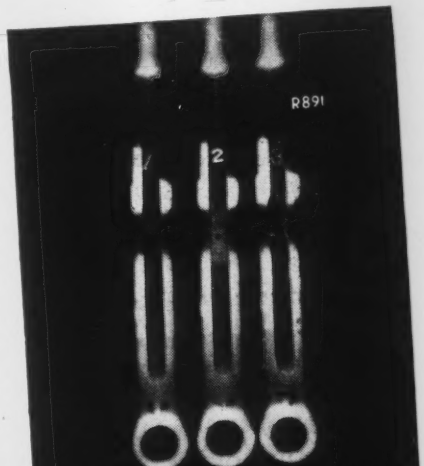
Non-magnetic parts having high tensile strength were required for special tractors. Amsco received an inquiry for a quantity of steering lever sets, with austenitic manganese steel specified; but the large amount of machining required ruled this metal out as the extreme toughness which gives it its durability also makes manganese steel difficult to machine with tools.

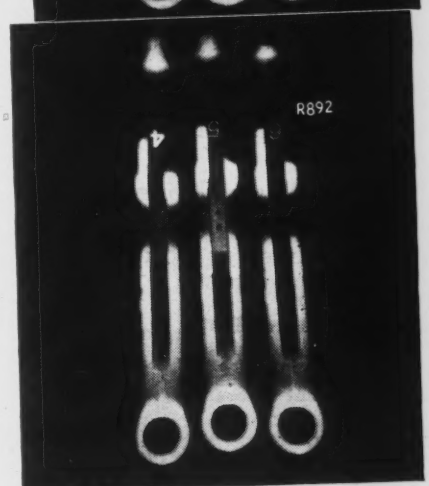
Amsco Alloy F-8N, a variation of the well known 18-8 grade of chromium-nickel alloy, having a magnetic permeability of approximately 1.003, was found satisfactory for these parts.

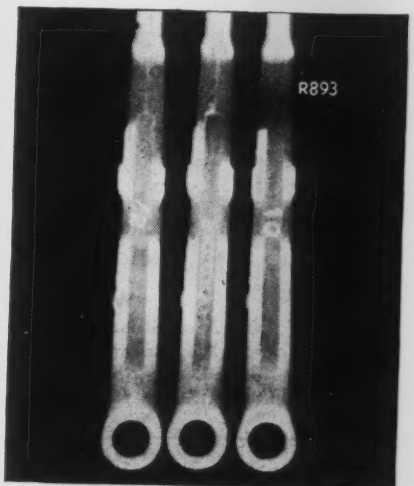
Small areas on each casting were to be flame-hardened (on the original cast steel specification). As it is not practicable to harden this particular grade of Amsco Alloy, a special hard-surfacing welding rod was developed by Amsco for the job. The castings were then coated on the required areas with this rod, before finish grinding.

Pictures R-891, 892 and 893 are reproductions of radiographs showing progressive stages in chill and heading practice to prevent shrinkage in the lever castings. The problem in producing these castings was the necessity of exceptional soundness. The shrinkage voids shown in R-891 and 892 were finally obviated (as seen in R-893) by various expedients that concentrated the shrinkage areas in a position where a feeder head could supply the necessary metal.

Inquiries regarding unusual requirements are always welcome at Amsco.





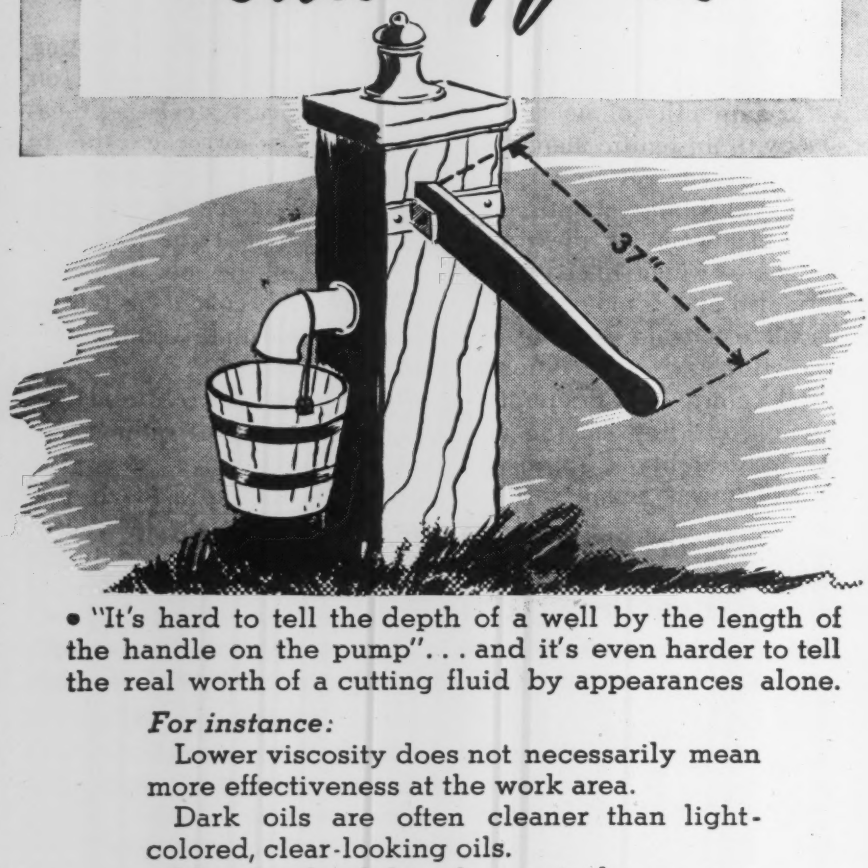


Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois

AMERICAN Brake Shoe COMPANY

FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

how to buy . . .
a cutting fluid



• "It's hard to tell the depth of a well by the length of the handle on the pump". . . and it's even harder to tell the real worth of a cutting fluid by appearances alone.

For instance:

Lower viscosity does not necessarily mean more effectiveness at the work area.

Dark oils are often cleaner than light-colored, clear-looking oils.

More total sulphur does not always mean better cutting quality.

Straight oils are often better refrigerants at the point of contact than soluble products.

Long dilutions often outperform oils used straight.

The wise buyer measures cutting fluids by how they perform on the machine. To find the best performing oil for his needs, he looks to experience.

D. A. Stuart Oil Co., specialists in industrial oils since 1865, share their experience with thousands of such wise buyers. They stand ready to do the same for you.

WRITE FOR YOUR COPY

of the *New* Stuart 60 page handbook: "Cutting Fluids For Better Machining." It is full of data—information that you will find a helpful guide to the most efficient use of cutting fluids. It is free to executives and engineers.

D.A. Stuart Oil CO.

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Warehouses in Principal Metal-Working Centers

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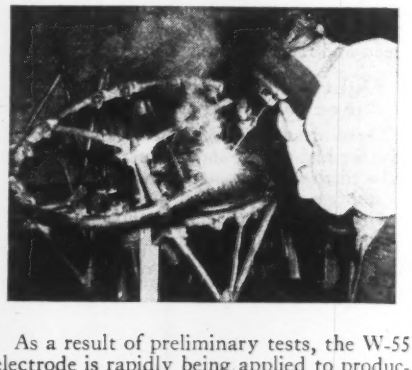
comparable to the mechanical properties of the parent metal, the new electrode, known as Type W-55, is especially designed for use in the manufacture of heavy bombers and transport planes.



As a result of preliminary tests, the W-55 electrode is rapidly being applied to production work in the aircraft industry. It can be used for welding in any position, including vertical welding from the top down and from the bottom up. Therefore, it is especially recommended for welding engine mounts and fuselage assemblies. The arc can be struck at the top of the joint and maintained while welding vertically downward, then overhead, then vertically upward back to the starting point.

Arcing characteristics of the W-55 electrode provide flexibility over a reasonably wide voltage range with stable operation throughout. The arc has sufficient force to keep slag from crowding the electrode when welding vertically downward, and the metal sets up quickly when welding overhead and vertically upward.

Characterized by its grey extruded coating, the W-55 electrode is recommended for operation on direct-current straight polarity or alternating current. A medium to long arc is recommended for best results. The W-55 is available in three sizes: $^{3}/_{32}$ x 12 inches, $^{1}/_{8}$ x 14, and $^{5}/_{32}$ x 14 inches.

Rubber Goods Manufacturers Take Advantage of Widened Permitted Use of Hycar

Rubber goods manufacturers are availing themselves of the opportunity to obtain special-purpose synthetic rubbers for applications which were prohibited prior to the liberalized WPB Rubber Order R-1, Hycar Chemical Co., Akron, O., reports.

The order as amended August 25, 1944 extended over 100 new uses for Hycar OR crude synthetic rubbers and approximately half of these are applications where such special-purpose synthetic rubbers never have been used before, Hycar points out.

Available only to high-prioriy war industries since Pearl Harbor, products made from Hycar are now being distributed to those who heretofore could only read about the wartime strides made in development of special-purpose synthetic rubbers. This wider distribution, according to Hycar, is taking place not only in the industrial field, but also in consumer goods.

Industrial applications, where the special-purpose synthetic rubber has proven superior to natural rubber by Hycar laboratory tests and by performance in actual usage, are those in which resistance is required to oil, gasoline or chemicals; to abrasion; to high and low temperatures; to cold flow or creep; and to metallic action. Tests also show high tensile strength and elasticity, and a hardness range from extremely soft to bone hard.

The largest independent producer of crude synthetic rubber made from buta-

diene, Hycar does not manufacture rubber products but supplies most of the large rubber goods manufacturers and hund reds of smaller firms with the special-purpose synthetic rubber from which these companies compound rubber products with the characteristics needed for special applications.

More common products made from Hycar include rubber hose, belt drives, gaskets, conveyor belts, rubber rollers, engine mountings, packings, industrial protective clothing, industrial truck tires, automobile and tractor parts. Automobile and other vehicular springs, upholstery materials, flexible pipe and conduit, tile and industrial floor coverings, electric cable jackets, protective coatings, are some of the products which may be made from the special-purpose synthetic rubber in the future, Hycar laboratory men foresee. The company's customer service laboratory is available to all manufacturers and users of rubber products.

Some of the Features of the Jet Engines

General Electric engineers can now disclose some of the advantages of the jet-propelled planes which the Company is equipping with gas turbine engines, among them the fact that the propellerless craft can take-off almost from scratch, without the warm-up required by conventional ships.

"Full thrust from the gas turbines is available in approximately 30 seconds after they are started, thereby eliminating any delay for warming up the engines," according to Company engineers.

Disclosure of this and other information about the jet plane power plant was permitted by the War Department concurrent with announcement of the news that Allied jet-propelled planes have been used successfully by the British against the German robot bombs. General Electric is building the gas turbines for the American version of the revolutionary-type aircraft, described as a single-seater, high-altitude fighter.

"The jet plane turbines operate satisfactorily with either kerosene or gasoline, the former fuel having less tendency than gasoline to ignite in the open air," G-E engineers state. "When the jet plane is in full flight, no visible flames come out of the exhaust. And because continuous ignition is not required, radio interference and high-altitude ignition problems are eliminated.

"The turbine is a compact, self-contained unit which has only one moving part. Air is taken into the turbine, compressed, and passed into chambers where its temperature is increased by the combustion of fuel, creating hot gases which are discharged through a tailpipe nozzle.

"Foward thrust of the plane is developed as the reaction to this high-velocity discharge in accordance with the physical law that for every action there is an equal and opposite reaction. A common example of this principle is the rotary lawn sprinkler, which is rotated in one direction by jets of water directed in the opposite direction."

"Because this thrust power is produced directly without requiring gearing or a propeller, vibration is minimized, and reduced weight per horsepower is made possible," the G-E engineers explain. "Thrust produced by the turbine is easily regulated and overhauls may be accomplished quickly when needed."

The gas turbines for the American type jet planes were developed by General Electric on modifications of a British design conceived by Group Captain Frank Whittle, of the Royal Air Force. Six months after the project was assigned to G. E. by the Army Air Forces in 1941, the Company successfully modified, developed, and produced the first jet-propulsion gas turbines in America.

They powered the P59A built by Bell Aircraft which made the first successful jet plane flight in this country in October, 1942. Since then the jet-propelled plane has been undergoing great development. Recently Gen. H. H. Arnold pointed out that great hopes are being held for it for future commercial as well as military use.

Although production schedules for jet-propelled planes have not been revealed, General Electric was permitted to announce last July that it was converting its second largest wartime plant of more than 600,000 square feet of floor space for the exclusive production of jet propulsion aircraft turbines.

Continued on page 38

Unusual Heating-Ventilating System Doubly Protects Workers

Strong drafts of ventilating air are kept from blowing on workers, and toxic vapors of benzol are constantly diluted and removed, as the result of careful engineering of a heating and ventilating system at the U. S. Rubber Company plant at Naugatuck, Conn. The system helps modernize working conditions in a plant of which part is 100 years old. The first rubber overshoes vulcanized in the country were produced there. Now it turns out rubber life rafts for the Navy.

Manufacturing areas are held between 68° and 72° F. by four blower-type heating units made by Carrier Corporation. Equipped

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Plus Engineering Service

The performance of Goulds Pumps in the practically continuous duty they are called upon to give in power plants today is testimonial to their dependability and durability. It is also evidence of the engineering knowledge you get in the recommendations of a Goulds engineer.

96 years of specialization in pump building backs up the selection of the Goulds pump for your liquid handling problem. For boiler feeding, hot and cold water circulating, sump, cooling tower or any other power plant duty, Goulds engineering service assures you of efficient, trouble free operations through the right selection of *the* pump for *the* job.

Goulds PUMPS INC.
SENECA FALLS, N. Y.

with thermostat controls, each heater has three non-sparking construction fans which circulate warmed outdoor air through overhead ducts. Mixing dampers are incorporated on the heating coils through which the fans force air. This prevents stratification of air and provides the circulation most satisfactory to the workers. There is no recirculation—air from outdoors is used altogether and is filtered through spun glass.

Supply grilles are located as near to the 10-foot ceilings as possible, so that the warmed air diffuses. Employees are thus protected from excessive exposure to direct drafts.

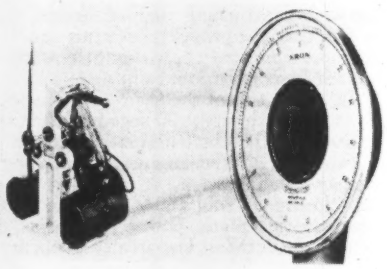
Completing the ventilation cycle, air is constantly exhausted from the room by four additional Carrier fans. These take air off the floor through a system of subway gratings connected by ducts on the ceiling below.

The idea of such exhaust is conventional enough, but the Naugatuck plant's expression of it is uncommonly extensive. The system can change the air 12 times an hour. This level of performance was requested for protection of the health and safety of the personnel, mostly women who work with rubber solvent all day in assembling life rafts. Because of the frequent change of room air, the solvents's toxic vapors do not concentrate above specified safe limits. Furthermore, manufacture is sped, because the movement of air hurries the drying of rubber cement.

More protection and processing aid are provided by ventilated work-tables on which solvent is applied to rubber sheets. Vapors from the operation are caught in an air stream at the table edge and exhausted through a plenum chamber underneath the table, then discharged outdoors. A lineal velocity of 600 to 700 feet per minute is maintained at the two-inch exhaust slot. Permanent hoods over the table edge are used on some tables. On others the same function is performed by flexible tubing and portable fan units like those used by welders.

Improved Kron Dial Mechanism Speeds Accurate, Dependable Weighing

The result of over 33 years of scientific research and development, the improved Kron ball bearing, springless dial mechanism of the double pendulum type is the precision-built "brain" around which every Kron Scale is designed and made. Combining rugged construction with extreme sensitivity, it speeds weighing, counting, batching, measuring and testing operations with accuracy and dependability by reducing these operations to a simplified "load and look" procedure.



Featuring specially designed ball bearings to eliminate wear at bearing points, the gear sector and shafts carrying the indicator and pendulum arm weights are all mounted in fixed centers. This assures perfect alignment at all times and prevents these parts from being unseated even when they are subjected to shocks or jarring vibrations.

Friction and wear of the dial indicator shaft and sector gear teeth are minimized through an auxiliary sector which absorbs backlash. A special non-vibrating sector can be incorporated in the mechanism to practically eliminate the effect of any outside vibration. Shocks and variations of temperature are completely compensated for by an adjustable and non-leakable oil dashpot. This entire dial mechanism is interchangeable in all Kron scales regardless of capacity or type.

Kron Scales are now made by The Yale & Towne Manufacturing Co., Philadelphia Division. Supplementing the full line of Yale Materials Handling Machinery, Kron Scales fill exacting industrial demands for accuracy and dependability in weighing, counting, batching, measuring, testing and inspecting operations in materials and production control.

• BUSINESS CHANGES

Harold F. Ray Joins Wickwire Spencer

The Wickwire Spencer Steel Co. announced today that Harold F. Ray has become associated with the Company in an executive accounting capacity.

Mr. Ray is well known in the industrial financial world. He has been associated with the Electric Bond & Share Co. for the past 21 years, the last four as Assistant Secretary and Treasurer.

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Design, construction and installation of complete plants and projects

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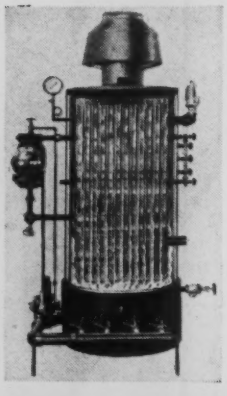
Bring us your post war problems for boiler work . . . our engineering consultation is available at all times.

The famous KANE, automatic, gas-fired . . . has everything you want in a steam boiler in sizes to 30 H.P. Engineers particularly will be interested in its scientific design.



The desired operating pressure is maintained by a patented double diaphragm valve which throttles gas input in exact proportions to steam demands.

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IMO OIL PUMP

Easy to pack

The De Laval-IMO rotary displacement pump for fuel and lubricating oils has only one stuffing box. It has been designed with the operator's problems in mind. Ease of packing is only one of the important and exclusive features.

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IMO I MOVE OIL

IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton 2, New Jersey

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Considered an outstanding authority in corporation financial and accounting management and procedure, Mr. Ray will assume accounting duties and responsibilities in connection with Wickwire Spencer's widespread operations including the Company's offices, warehouses and steel plants.

Mr. Ray will make his headquarters at the Company's New York office, 500 Fifth Avenue.

Eklund Now Chief Engineer of D. J. Murray Mfg. Co.

Henrik J. Eklund is now chief engineer of D. J. Murray Manufacturing Co., Wausau, Wisconsin, according to an announcement by that company. Since 1933 Mr. Eklund has been associated with the designing and development of paper and pulp mill machinery, both in the United States and Finland.

Mr. Eklund is a graduate of the Polytechnic Institute of Finland in Mechanical Engineering with a Master's degree, with 2 years of post-graduate course at the same college. Since coming to the United States in 1936, he has been associated with several of the outstanding manufacturers of paper mill machinery.

With D. J. Murray Manufacturing Co. he has charge of designing, engineering, supervising, and development work.

R. C. Wilson Appointed Sales Manager Farrel-Birmingham Buffalo Division

Farrel-Birmingham Co., Inc., of Ansonia, Conn., and Buffalo, N. Y. announce the appointment of R. C. Wilson as sales manager of its Buffalo division, in charge of sales of gears, gear units, flexible couplings and related products.

Mr. Wilson was born in Elmira, New York, where he received his early education. Following his graduation from the University of Rochester in 1925 with a degree of Bachelor of Science in Mechanical Engineering, he was employed by the Gleason Works in Rochester for seven years. While with that company he specialized on spiral bevel gears and the development of the hypoid gear. Coming to Farrel-Birmingham Co. in 1934 as Sales Engineer, Mr. Wilson worked in that capacity until 1942 when he became assistant to the Sales Manager, which position he held until his present appointment.

Robins Conveyors Appoints

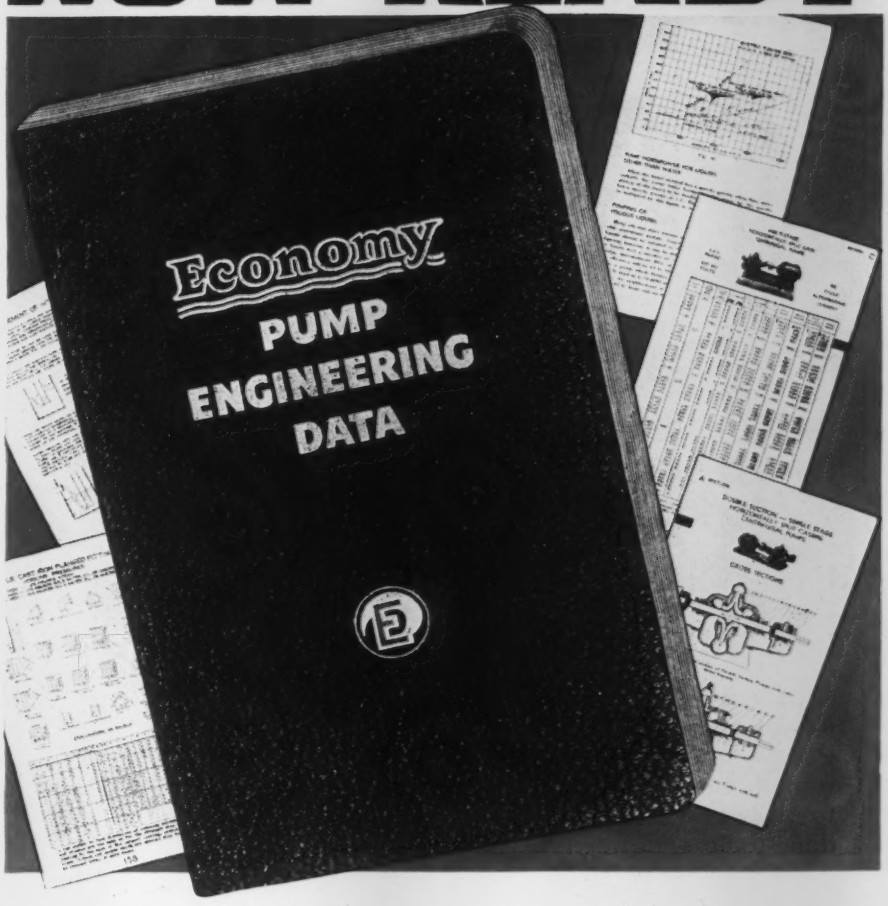
Thomas Matchett, President, Robins Conveyors Inc., Passaic, N. J., engineers, manufacturers and erectors of materials handling machinery, announces that, at a recent meeting of the Board of Directors, three new appointments were made: Harold E. Murken has been appointed Controller and Assistant Secretary, T. Webster Matchett has been appointed Secretary and John T. Hoyt has been appointed Treasurer. All have been with Robins for some time.

H. E. Murken joined the company early in 1927, working his way through various accounting and administrative departments to his present position. A graduate of Pace Institute, New York, he started his business career in the sales department of American Steel & Wire Wks., leaving there in 1923 to enter the employ of Broderick & Bascom Rope Co., in the New York office. Two years later, he transferred to the Gutta Percha Rubber Mfg. Co., Brooklyn, N. Y., from which company he joined Robins Conveyors Inc.

T. W. Matchett came to Robins in 1933. After graduating with a degree of Mechanical Engineer from Lehigh University, he was employed by Westinghouse Electric & Mfg. Co., at East Pittsburgh, Pa. Upon complet-

Continued on page 40

NOW READY



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A timely contribution to the pump industry—350 pages of 1945 data just when vital postwar problems require authentic facts, sound experience and advanced engineering practice.

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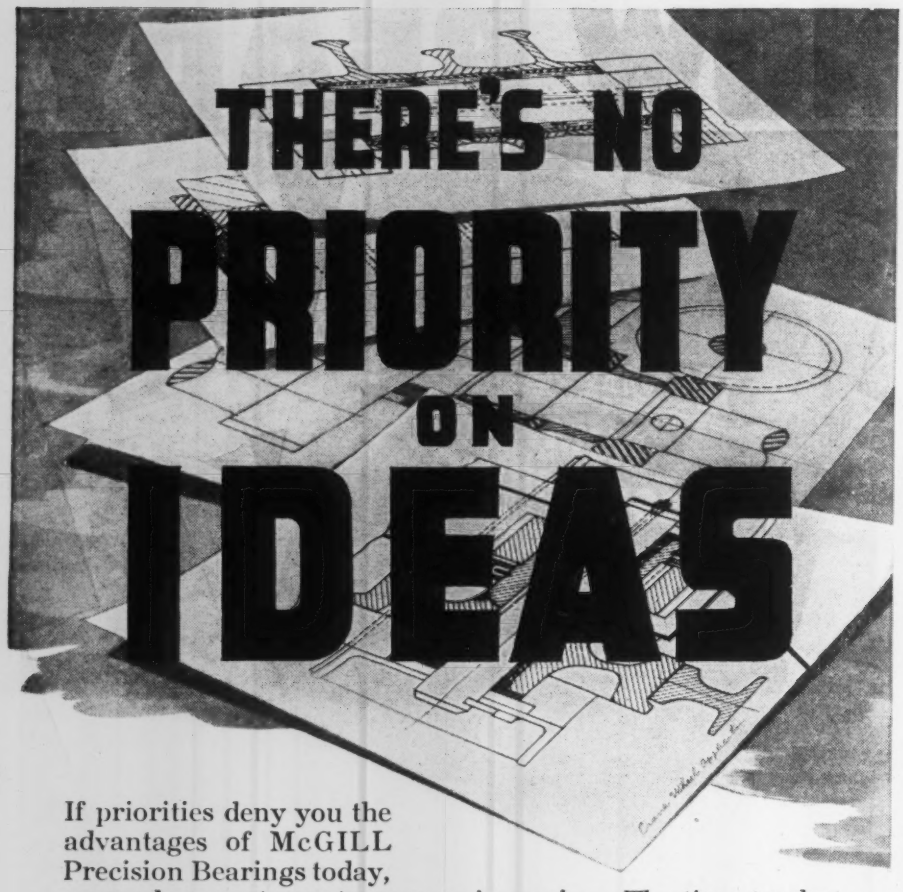
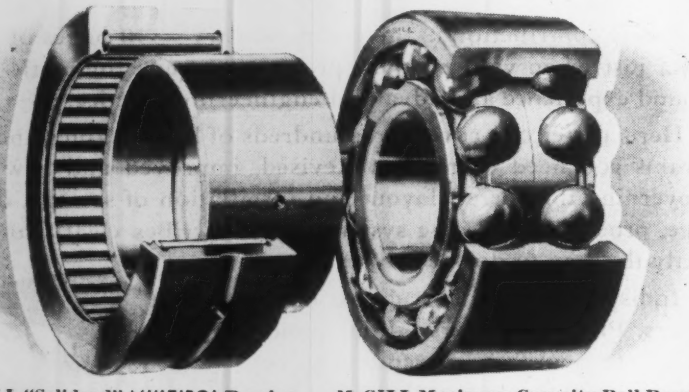


If priorities deny you the advantages of McGILL Precision Bearings today, remember, **post-war tomorrow** is coming. The time to plan for it is now! A year from now what will we wish we had done today?

Experienced McGILL engineers are ready and eager to assist you in improving your **future** bearing applications. This service is yours for the asking. There is no priority on ideas. The satisfactory service record back of McGILL Ball and Roller Bearings makes their use a selling "feature" in any machine.



McGILL "Solidend" *MULTIROL* Bearing — McGILL Maximum Capacity Ball Bearing

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ing a sales training course, covering diverse phases of company operation, he was assigned to Field Office service which took him to various cities. On joining Robins Conveyors, he entered the Shop, working in the different departments to familiarize himself with their functions. Later, he was transferred to the Sales Dept., where he served until the demands of war necessitated instituting a Priorities Div., which he was appointed to head. Now, he is in charge of coordinating production. T. W. Matchett is a member of both the Executive Committee and the Board of Directors.

J. T. Hoyt joined Robins Conveyors in 1942 as Controller. For many years, he was engaged in the manufacture and sale of industrial equipment as well as in process engineering work in such industries as mining, metallurgy, chemical, cement, blast furnace and others. Later, he became Vice President and Treasurer of the United Filters Corp. and, subsequently, President and Treasurer of Pariette Gilsonite Co., operating a Gilsonite property in Utah. A graduate of Columbia School of Mines, Mr. Hoyt is a member of the American Institute of Mining and Metallurgical Engineers and of the Columbia University Club. During World War I, he served with the AEF in France as Captain of heavy artillery.

Sprankle Now With Timken Steel and Tube Division

A. F. Sprankle has been appointed Metallurgical Engineer in The Timken Steel and Tube Division, according to a recent announcement by The Timken Roller Bearing Co., Canton, Ohio. He was formerly Manager of the Alloy Bureau of Carnegie-Illinois Steel Corp. in the Pittsburgh District.

A graduate of Ohio State University, with a B.S. degree in Metallurgical Engineering, Sprankle has done three years of laboratory work at Battelle Memorial Institute in Columbus, Ohio. In 1934 he first joined Timken specializing in bearing and high temperature steels. While in Pittsburgh in addition to his regular activities he gave a series of lectures on alloy steels to post graduate students at Carnegie Institute of Technology night school.

Besides his ASM and AIME memberships, Sprankle has been active on the following committees: AISI-Alloy Technical Committee, Ferrous Metallurgical Advisory Board, Sub-committee on Gun Forging, Bearing Sub-committee and General Purpose Subcommittee of WPB's Technical Advisory Committee, and various project committees of the National Research Council.

He is the son of Mr. and Mrs. C. F. Sprankle, of Massillon, Ohio, and is a resident of Beverly Hills, Massillon, with his wife Virginia A. Sprankle and two children, William C., 8, and Ann L., 6.

Smith Now With Carrier

Frederick W. Smith, for ninteeen months Chief of the Special Equipment Branch of the General Industrial Equipment Div. of the War Production Board, will become associated with Carrier Corp. on November 1, it was announced today by Cloud Wampler, President of the Syracuse, New York, air conditioning and refrigeration company.

The Special Equipment Branch of WPB has jurisdiction over five important industries, including refrigeration and air conditioning.

Prior to his association with the War Production Board in April, 1942, Mr. Smith was for sixteen years connected with the Frigidair Div. of General Motors Corp. in a variety of capacities, including application

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engineer, district sales manager, and most recently New England manager of the Commercial Refrigeration and Air Conditioning Div. of the company.

Mr. Smith is a graduate of Dartmouth and of the Amos Tuck School of Business Administration at Hanover, New Hampshire.

Beck Now Chief Engineer

Manning, Maxwell & Moore, Inc., of Bridgeport, Conn., announce that Rudolf Beck has been appointed Chief Engineer of the American Instrument Division.

Mr. Beck first started his employment in the Engineering Department of the American Schaeffer & Budenberg Co., who were later consolidated with Manning, Maxwell & Moore, Inc. Previous to his long connection with M.M.&M. Mr. Beck's experience in engineering was with the American Bosch Magneto Co., B. F. Sturtevant Co. and Brown-Boveri of Switzerland.

His many friends in the engineering field will be glad to learn of his recent advancement.

Worthington Names C. W. Camp Consulting Electrical Engineer

Worthington Pump and Machinery Corp., Harrison, N. J., announces that C. W. Camp, formerly with Crocker-Wheeler Electric Manufacturing Co. for 38 years, specializing in application engineering, is now associated with Worthington as Consulting Electrical Engineer.

A former executive member of the National Association of Electrical Manufacturers, Mr. Camp brings a wide background of experience in the electrical industry to his new work with Worthington's Public Utilities Department.

Mr. Camp, who replaces the late Harry Wood, will assist in solving electrical application problems for all Worthington sales divisions and district offices. His services will also be utilized by the company's manufacturing departments.

Westinghouse Names New Manager

C. B. Stainback, manager of the Industrial Department of the Westinghouse Electric & Manufacturing Co., announced the appointment of B. M. Brown as manager of the Petroleum and Chemical Section.

Mr. Brown succeeds Q. M. Crater, who was transferred to the Detroit, Mich., office of the Industrial Department as assistant manager.

The new section manager joined Westinghouse as a member of the student course in 1941 and then served in the Machinery Electrification Section until 1943. During that year he left the Company for short time to work with the Pomona Pump Company, Pomona, Calif., but returned in December, 1943, to the Transportation Department and served there until his present appointment.

A native of Joliet, Ill., Mr. Brown attended the Joliet Township High School and received his Bachelor of Science degree in Electrical Engineering in 1931 from the University of Illinois.

Wickwire Spencer Metallurgical Appoints Jack W. Forbes Sales Manager

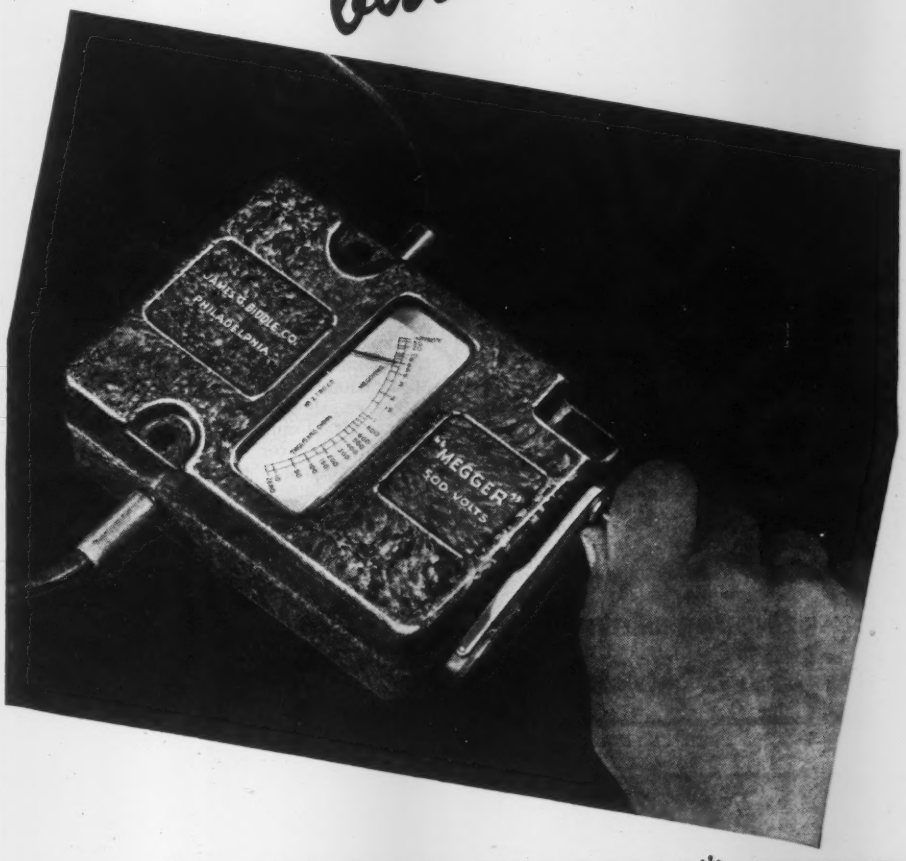
The Wickwire Spencer Metallurgical Corp., Subsidiary of the Wickwire Spencer Steel Co., announced today the appointment of Jack W. Forbes as Sales Manager.

The Wickwire Spencer Metallurgical Corp. is a recently formed subsidiary. Fine drawn molybdenum and tungsten wires for the electronic industry, and tungsten carbides and dies, are manufactured.

Mr. Forbes, before his assocaition with Wickwire Spencer, was with the Western

Continued on page 42

Small . . . but MIGHTY!



. . . the MIDGET "MEGGER"* TESTER is ALWAYS READY FOR USE . . . ANYWHERE

Weighing but 3 pounds, this mighty midget can be carried in a coat pocket or tool kit . . . instantly available for testing insulation resistance of practically all types of electrical equipment . . . indispensable for maintenance and trouble shooting, even where the higher range "Megger" sets could be used. Reads up to 50 megohms and delivers 500 volts d-c from a built-in hand-cranked generator, making it independent of batteries or external power supply.

If you are not already familiar with this smallest and in many ways the most remarkable instrument bearing the "Megger" trademark, write for Bulletin 1545-M.

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Ask also for Bulletin 1735-M describing the new U. S.-made "Megger" Testers.

JAMES G. BIDDLE CO.

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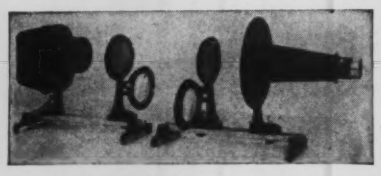
Polaroid*... Photoelastic Polariscope

for Stress Determination



To the machine designer, photoelastic stress analysis is not only of value in the verification of calculations based on theoretical solutions, but also in the solution of problems where theoretical analysis is not available. Where weight and space must be conserved actual stress distribution is more important than stress indicated by theoretical analysis.

In the new model polariscope of 4¼" clear aperture, the parallel beam is collected by a rear element and condensed through a three component lens of the Cooke system. In the new larger unit (8¼" aperture) a four component lens of the Omnar system is used. *The image is sharp throughout the field, free of aberration, astigmatism and distortion.*

Literature of new model polariscope now available

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* *T. M. Reg. U. S. Pat. Off. by Polaroid Corporation*

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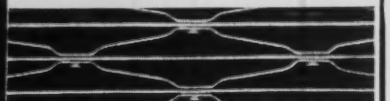
FLOORING AND STAIR TREADS

"A Fitting Grating for Every Purpose"



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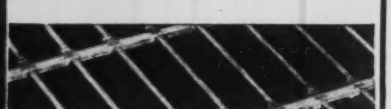

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Electric Co. for 6½ years. At the Western Electric Kearny Works, Kearny, N. J., he was engaged in the scheduling and planning of production. For the past 3½ years he was the buyer of tungsten and molybdenum and head of the Service Department for Western Electric Tube Shop, New York.

In his new position with the Wickwire Spencer Metallurgical Corp., Mr. Forbes will be in charge of all sales activities. The Company is currently planning greatly expanded sales operations.

Porter Appoints Failmezger Sales Manager of Quimby Pump

H. K. Porter Co., Inc. of Pittsburgh, Pa., has appointed Victor Failmezger, previously application and field engineer for the Company to the position of Sales Manager of its subsidiary, Quimby Pump Co., of Newark and New Brunswick, N. J.

Expansion of Quimbly pump facilities for the chemical and oil fields, and in special application, will be an important phase of an extensive sales program planned by Quimby, under Mr. Failmezger's direction, W. W. Calihan, Director of Sales for Porter and Subsidiaries, said in making the announcement.

During the past year, Mr. Failmezger has represented Porter and its subsidiaries in Western Penna., West Virginia, and Eastern Ohio.

Mr. Failmezger is a graduate of Stevens Institute of Technology with degree of Mechanical Engineer. He was associated with Westinghouse Electric & Mfg. Co., and Worthington Pump Co. in both sales and application engineering in the 15 years prior to joining the Porter organization.

Ives Now Chief Engineer of Kieley & Mueller

Kieley & Mueller, Inc., North Bergen, N. J., manufacturers of pressure and flow control equipment, announce the appointment of Clifford B. Ives as Chief Engineer of their organization.

He has been closely associated with control problems for the past fifteen years and will direct the expansion of Kieley & Mueller products in this field.

Close cooperation with users of this type of equipment is planned and every effort will be made to produce additional quality items to meet the exacting requirements of the industry.

Wickwire Spencer's Purchasing Department Moves to Buffalo, N. Y.

Wickwire Spencer Steel Co. announces that the Purchasing Department will be located at River Road, Buffalo, N. Y. The Purchasing Department has been previously located at 500 Fifth Avenue, New York 18, N. Y.

In the future all purchases and procurements for Wickwire Spencer and the Company's subsidiaries, American Wire Fabrics Corp., Wickwire Spencer Aviation Corp. and Wickwire Spencer Metallurgical Corp. will be handled through Buffalo. The new offices of the Purchasing Department will be located adjacent to the Company's large Buffalo plant.

Wickwire Spencer's Mechanical Specialties Division Moves to Massachusetts

The Wickwire Spencer Steel Co. announced that the General Sales Office of the Mechanical Specialties Division will be located at Clinton, Mass., where the products of this division are manufactured. The Mechanical Specialties general sales office has been previously located at 500 Fifth Avenue, New York 18, N. Y. A District Sales Office of this division will continue to be maintained at the New York address.

In announcing the change, Fred Hale, Mechanical Specialties Sales Manager, emphasized that the products of this Wickwire Spencer unit are highly specialized. The relocation of the General Sales Office will en-

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RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

• Keep Informed

able his division to better serve customers through closer coordination of sales and manufacturing, including operating, engineering and scheduling.

Products of the Mechanical Specialties Division of Wickwire Spencer include, Industrial Wire Cloth, Metal Conveyor Belts, Card and Napper Clothing, Perforated Metals and Grilles.

Buxton Appointed Assistant Sales Manager for Cooper-Bessemer Corporation

A. M. Buxton has been promoted to assistant sales manager of The Cooper-Bessemer Corp., it is announced by S. E. Johnson, general sales manager, with headquarters at Mount Vernon, Ohio.

In addition to sharing responsibilities of the general sales manager, Mr. Buxton will direct the Company's oil and gas field sales, according to Mr. Johnson, since he has been working closely with these fields in his former position at the Company's Tulsa office.

Mr. Buxton has been with Cooper-Bessemer for 20 years. He is 43, married and has one child. He has moved his residence from Tulsa to Mount Vernon.

• LATEST CATALOGS

Leeds & Northrup Instruments, Telemeters and Controls Described in Recent L&N Publication

Power plant owners, engineers, and operators should be interested in a recent L&N publication which describes, for the first time under one cover, all Leeds & Northrup's measuring instruments, telemeters, and controls, for regulating power plant processes. The equipments are briefly described in one compact section of this "General Catalog" issue of "Modern Precision" . . . are illustrated by means of diagrams and installation photographs.

For easy reference, the equipments are grouped according to their applications. Under the heading, "Electrical Generation", are those for measuring load telemetering and totalizing, frequency and time deviation, kvar, voltage and generator temperatures. Under "Generation of Steam, Hydro and Diesel Power", those for measuring gas analysis, smoke density, speed, electrolytic conductivity and boiler temperatures in steam plants; liquid level and hydro temperatures in hydro plants; engine temperatures in internal combustion plants.

Four other equipments are described in some detail: the Centrimax Flowmeter; the L&N Load-Frequency Control; Metermax Combustion Control, a pneumatic-electric system; Type P Combustion Control, an all-electric system.

Included also in this publication are all the L&N equipments for regulating industrial processes, as well as the L&N heat-treating furnaces and the L&N laboratory instruments, long used by plant technicians.

Anyone who doesn't already have a copy of this 28-page publication may receive one by writing Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa. Please be sure to specify Folder ENT(7a).

Relays and Solenoids

A four-page illustrated bulletin gives details and operating characteristics on eight relays and eight solenoids. Relay charts show standard voltages, maximum contact capacity, coil resistance, and operating

Continued on page 44

Instant
STEAM OR AIR RELEASE
with Light Lever Pressure

MODEL CBV—Compound-Balanced Quick-Opening Valve for Steam or Air
(Furnished with flanged or female threaded ends)

No "hanging on the ropes" when you open a "CBV". Line pressure is used to help lift the disc. No sticking. You get instant control with light lever pressure.

The CBV is made in bronze or Monel metal . . . in 1½", 2", 2½" and 3" sizes. You can use this valve for manual input-control of air or steam . . . on many different kinds of equipment. Among other applications, the CBV is recommended for use with Lonergan whistles.

Write for data on the CBV . . . also catalog of Lonergan whistles . . . made in plain and chime types . . . sizes 1½" to 12", outstanding in tone and efficiency.

"PNV" plain whistle — one of many Lonergan types

J. E. LONERGAN COMPANY, 213 Race Street, Philadelphia 6, Pa.

Lonergan

Safety Valves · Relief Valves
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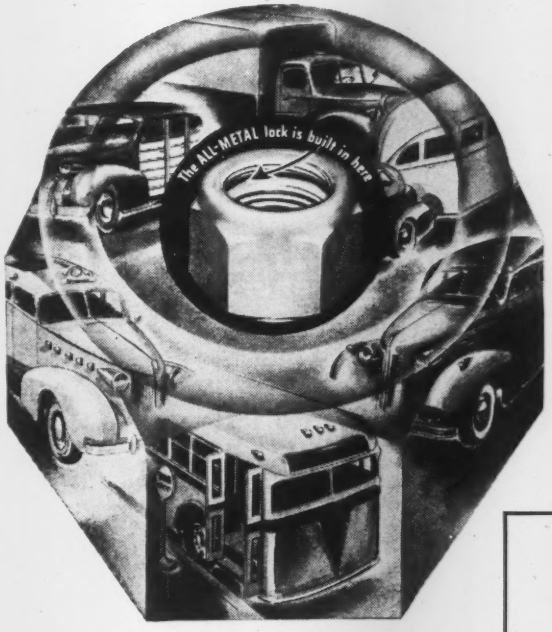
SINCE 1872—*Makers of Pressure-Safety Appliances for the Power, Mechanical and Process Industries*

99% Say "THESE ARE *THE* NUTS!"



"These nuts will be like a gift from heaven!" said a Kansas fleet owner in a recent survey.*

Ninety-nine out of every hundred replying said "YES!", when asked if Boots All-Metal Self-Locking Nut would improve post-war equipment.

More than 1000 fleet operators answered this survey. They named 60 spots where loose nuts cause breakdowns.

On these spots, the Boots Nut was tested on many trucks. Eighteen months of hard driving couldn't shake this one-piece nut loose from any connection! The Boots grip is unaffected by heat, gasoline, chemicals. Easily removed with a wrench. Can be used again and again.

*Operators of 110,000 motor vehicles indicated in this survey that if a vibration-proof nut like the above were standard on their post-war equipment, tens of thousands of dollars for maintenance and repairs would be saved.

Motion Picture—"All Work And No Play"—16 mm. sound—30 minutes. Write for information

BOOTS
SELF-LOCKING NUTS
"There's No Excuse for a Nut Shaking Loose"

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current. Solenoid charts give resistance and operating current at standard voltages and show stroke and lifting capacity of small solenoids. Guardian Electric Mfg. Co., Dept., S-R, 1619 West Walnut Street, Chicago 12, Ill. Ask for bulletin S-R.

Complete Dredger's Bulletin Issued by Amsco

A 56-page catalog bulletin for dredgers, No. 844-D, has just been released by the American Manganese Steel Div. of American Brake Shoe Co. This fully illustrated booklet tells about the important part played by austenitic manganese steel, "the toughest steel known," in the operation of dredges of all types.

The romantic history of placer dredging from a half-century ago is colorfully told by Corey C. Brayton, the prominent west coast engineer, who also outlines the essential working parts of a standard gold dredge.

Ladder dredge operators will be particularly interested in the exhaustive discussions of the parts subjected to wear such as buckets and bucket lips, pins and bushings, tumblers, ladder rollers, screen plates, riffles, etc. These discussions are accompanied by photographs of dredges in many parts of the world.

Another section of the booklet deals with dipper dredges and the problems encountered in subaqueous excavations with equipment of this type. Illustrations are included of various types of dippers, buckets, bails, stick racks, pinions, etc.

Bulletin 844-D also includes material on pumps for suction dredges, pipeline fittings, Eagle, "Swintek" screening cutterhead, sheaves, gears, rollers, etc.

A copy of this bulletin—No. 844-D—will be sent at once, without obligation, on request made to Amsco at Chicago Heights, Ill.

A Control System for Electrically Heated Salt Pots

A method for holding constant the temperature of electrically heated salt pots, by means of a reliable control system which readjusts promptly the rate of heat input at the first indication of a temperature change, is described in a new 8-page bulletin just issued by Leeds & Northrup Co.

It describes equipment which is suitable for either internally or externally heated salt pots—a Rayotube detector and a Duration-Adjusting Type of Micromax Electric Control. Together they comprise a system developed to provide the same close regulation which M.E.C. control formerly made available only to those fired by fuel.

Where this control is used, it is claimed that bath temperature is held uniform during heat treat and is brought back quickly to control point each time new work is added. Overshoots are prevented, rejects are reduced and more and better work results.

This control system is said to be easy to operate, to maintain and to install. Once the controller has been set to the desired operating temperature, control is automatic. The Rayotube, which sights downward into a closed-end tube immersed in the bath, or simply sights directly on the surface of the bath, holds its calibration indefinitely . . . needs no replacement. The Micramax controller and M.E.C. control unit can be shipped mounted on a factory-wired panel. No tapped transformer is required.

A copy of this illustrated publication is available to anyone interested. Write for Bulletin N-33B-621(1) "To Maintain Temperature of Electric Salt Pots—Micromax Electric Control (D.A.T.)", Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.

A-C Welding Electrodes

A new bulletin on arc welding electrodes has just been released by Allis-Chalmers Mfg. Co. The bulletin, which gives a complete description of each electrode in the Allis-Chalmers line, also includes separate charts on physical properties of weld metal for each electrode as well as on recommended current values. The electrodes, making up a new Allis-Chalmers line, are both a-c and d-c types and are easily identified by officials AWS classification numbers.

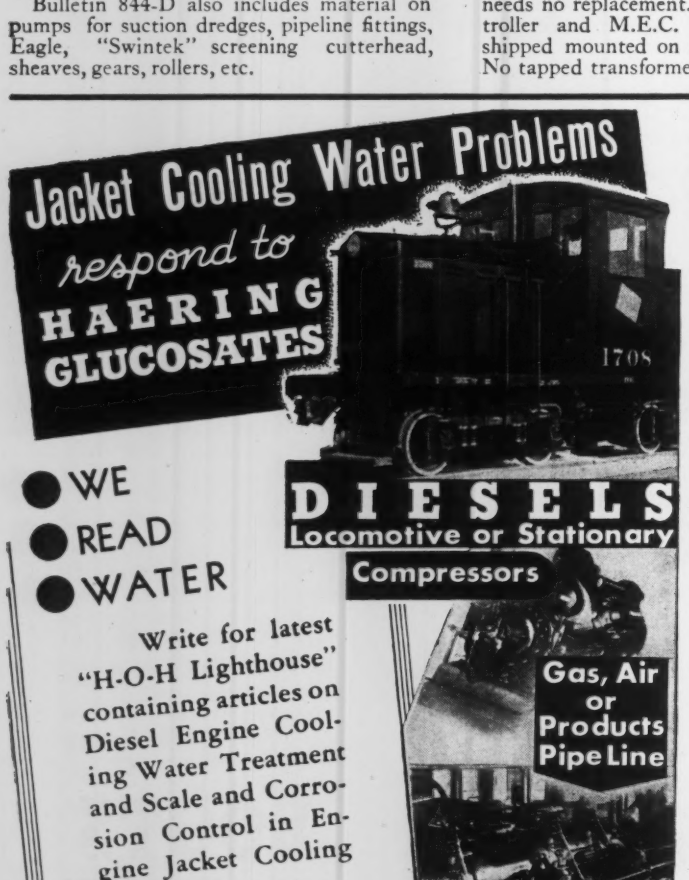
The bulletin L6348 may be obtained by request from Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

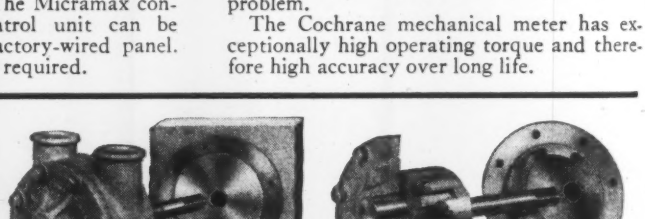
Cochrane Tilting U-Tube Mechanical Meter

Cochrane tilting U-Tube mechanical type meter is illustrated and described in Publication 3010-31 which will be sent upon request.

Three fundamental features are incorporated in this high torque mechanical meter. (1) Flow measurement by response to difference in pressure by a mercury seal in a U-tube. (2) Weighing mass by means of a beam balance. (3) The use of torsion tubes as the scientific solution of the stuffing box problem.

The Cochrane mechanical meter has exceptionally high operating torque and therefore high accuracy over long life.





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how TUTHILL PUMPS can be built into the design of your machine

To save space, material and money, Tuthill builds stripped pumps for you to incorporate directly into the design of your machine. These internal-gear rotary pumps are furnished without mounting bracket or without housing as pumping elements —for coolant, lubrication, hydraulic and liquid transfer service. Capacities from 1 to 50 g.p.m. Write for Tuthill Stripped Pump Bulletin.

★

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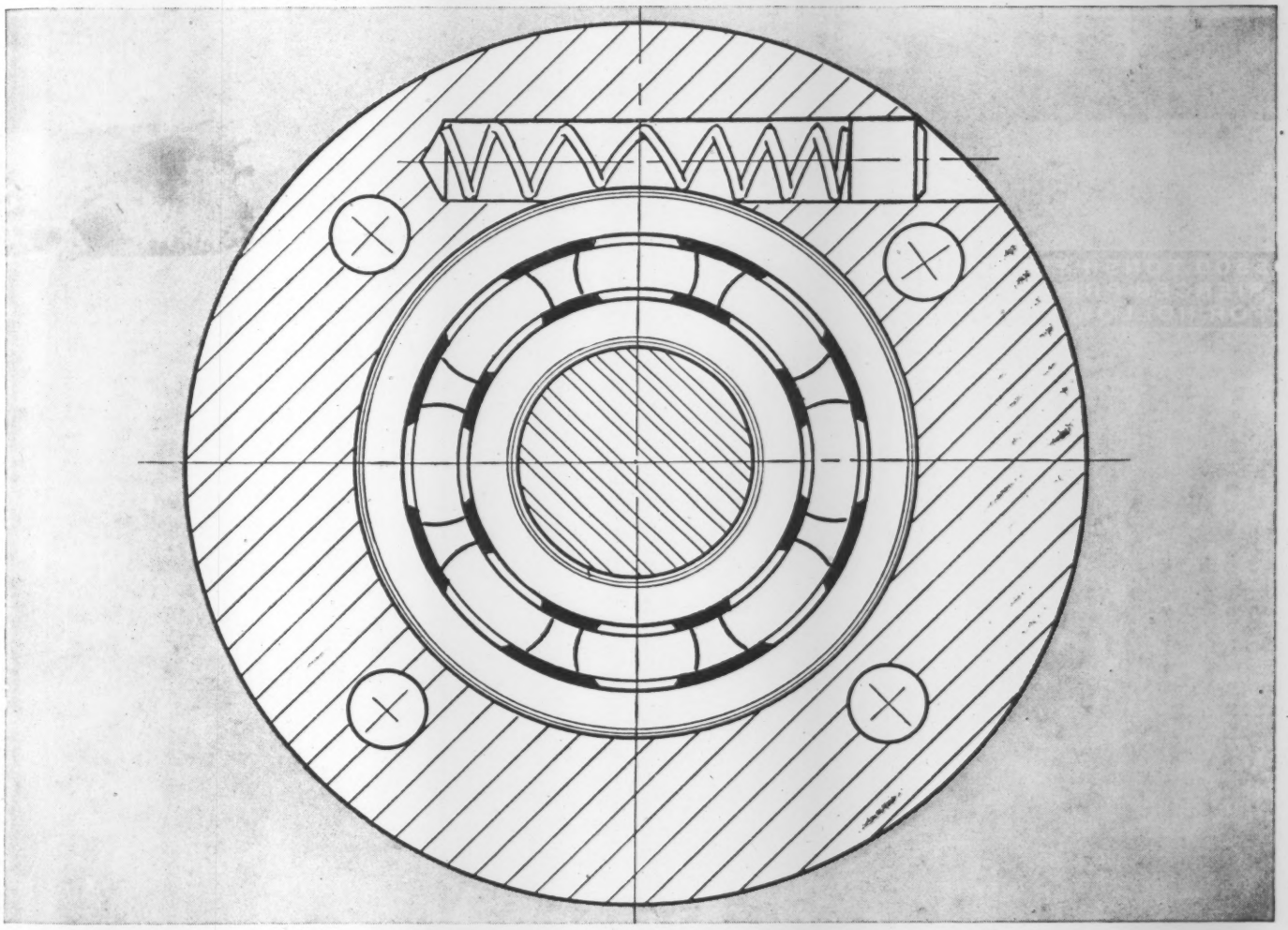
A Bearing Tip . . .

for your design notebook



When small ball bearings, often run at higher speeds, must be mounted loose in the housing, a spiral spring contacting the outer ring as shown above, is a simple and effective means of preventing excessive slippage, housing wear and resultant formation of iron oxide. When correctly proportioned the coils of the spring are distorted and impose a certain amount of radial pressure on the outer ring. While this does not prevent axial movement of the bearing it does have the effect of stopping the ring from excessive rotation in either direction. New Departure engineers will gladly give further details. Ask for our new series of novel yet practical bearing mounting ideas for specific condition problems. 3326

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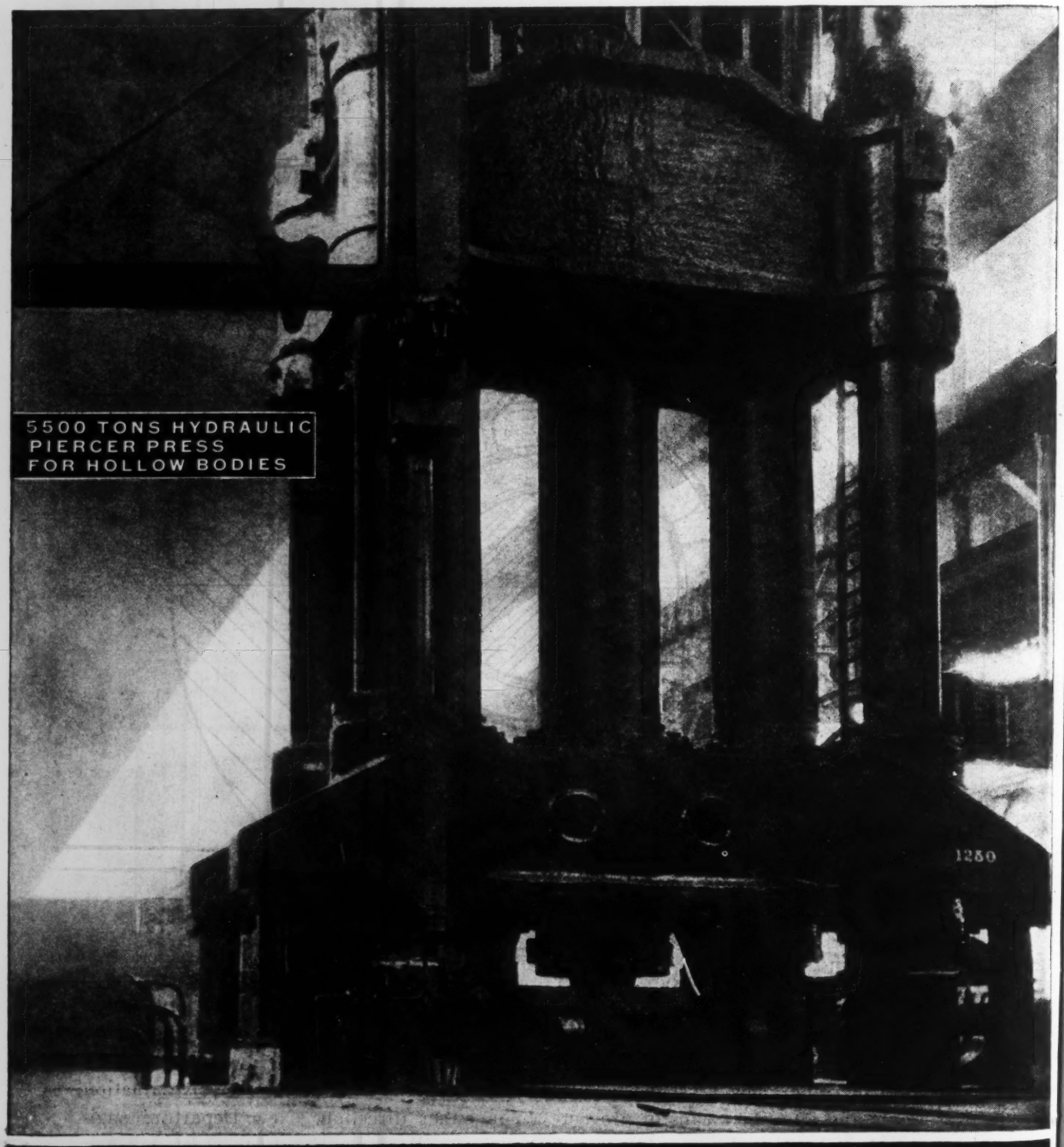

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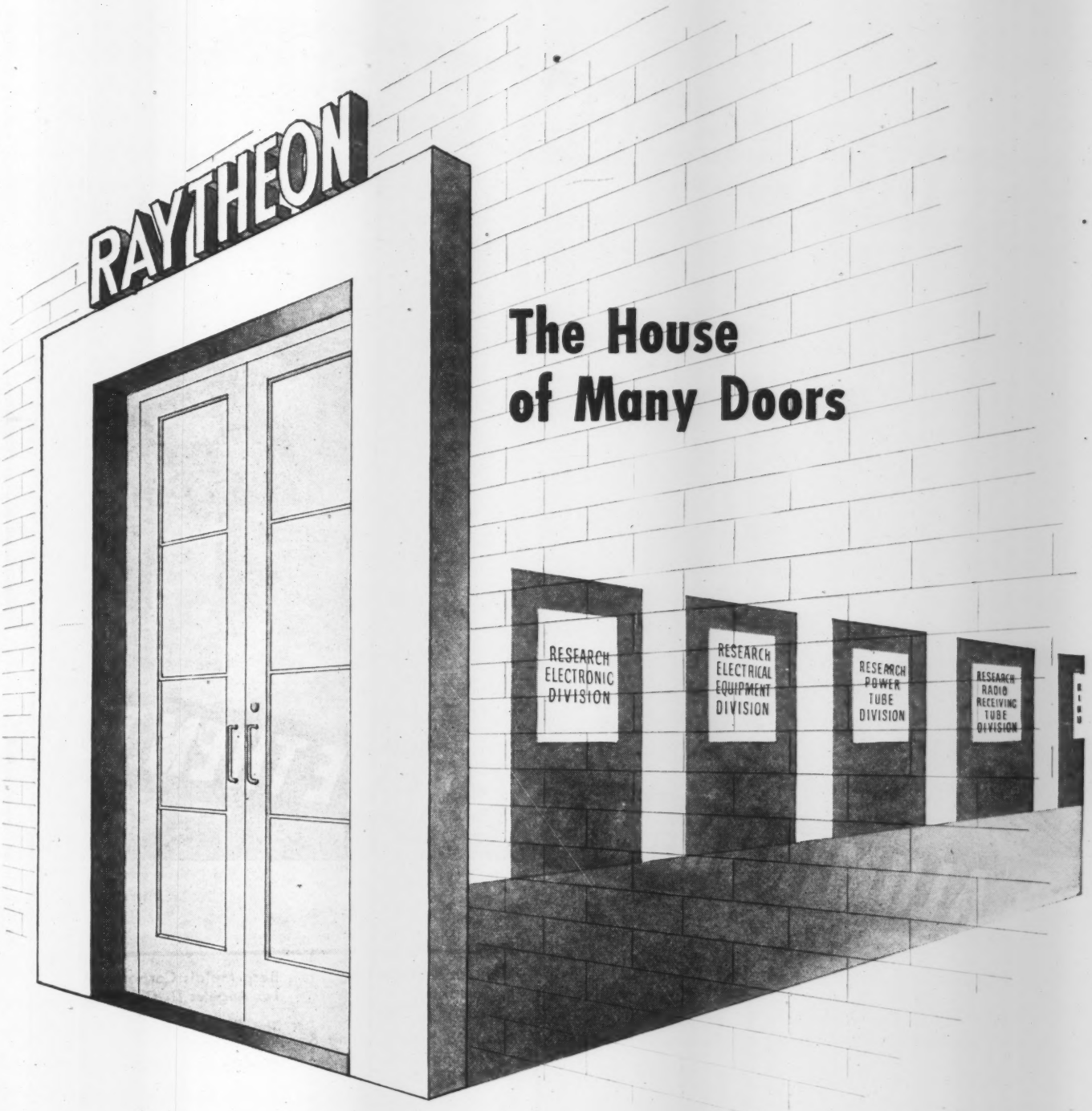

The House of Many Doors

RAYTHEON is truly a house of many doors . . . doors that lead to many research, engineering, and production groups which have made great contributions to the quality and quantity of electronic equipment and receiving and transmitting tubes now helping the armed forces.

Today, behind these closed doors over 16,000 men and women are devoted to war work. Tomorrow, these doors will be wide open and through them will come new developments in all phases of electronics.

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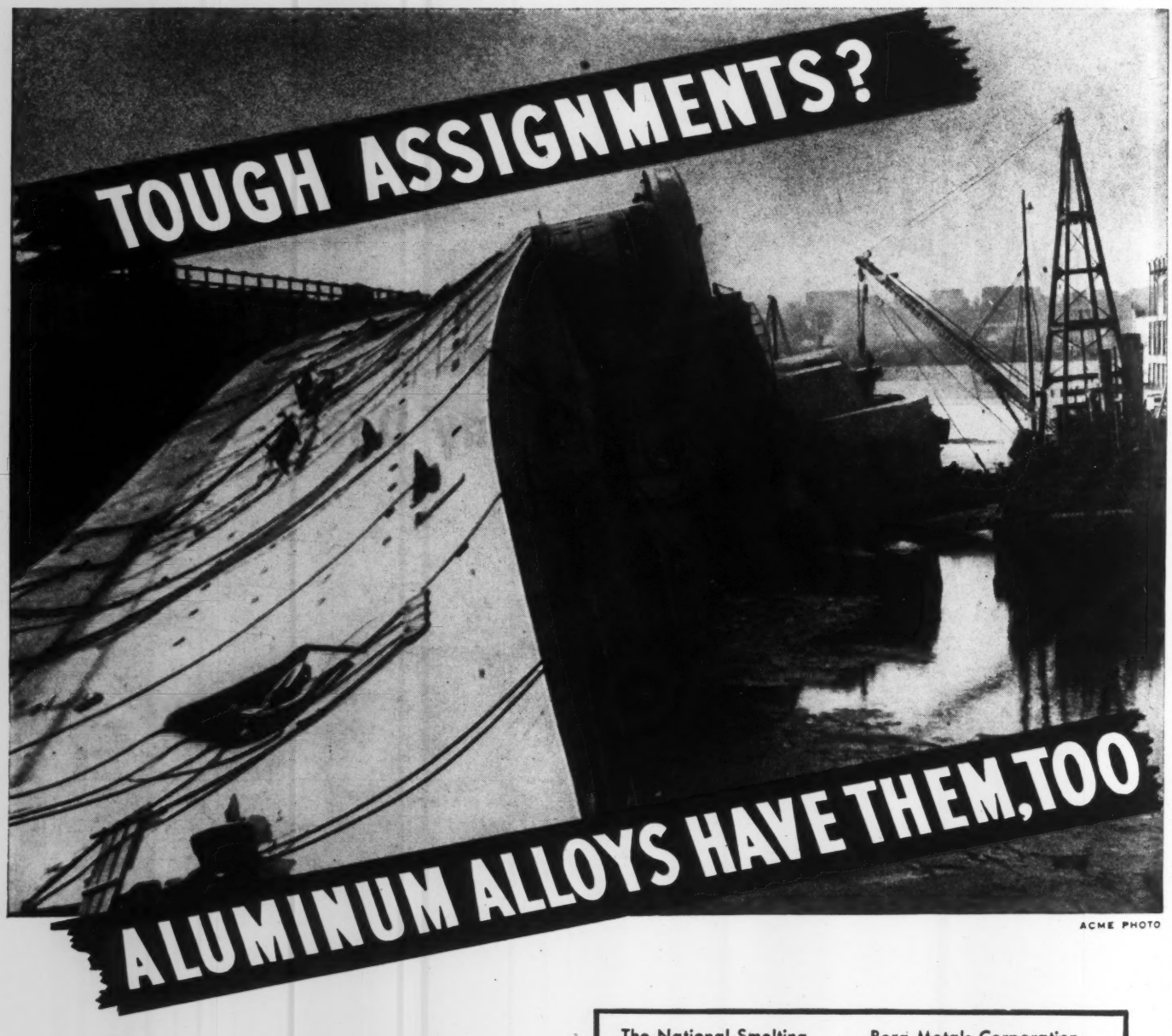

ACME PHOTO

THE righting of the Normandie was a tough assignment, but it proved an opportune school for training hundreds of Navy divers.

Aluminum Alloys furnished by us are also meeting tough assignments daily, such as the punishing service in aircraft, tank and marine engines. At the same time, other much smaller and more delicate parts made from our Alloys are functioning with extreme precision in an equally important, but less spectacular, manner.

In the production of the Alloys to meet these tough assignments, our forces, too, have found a valuable training ground . . . training which will be invaluable to you in your problems of post-war production.

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BAKELITE

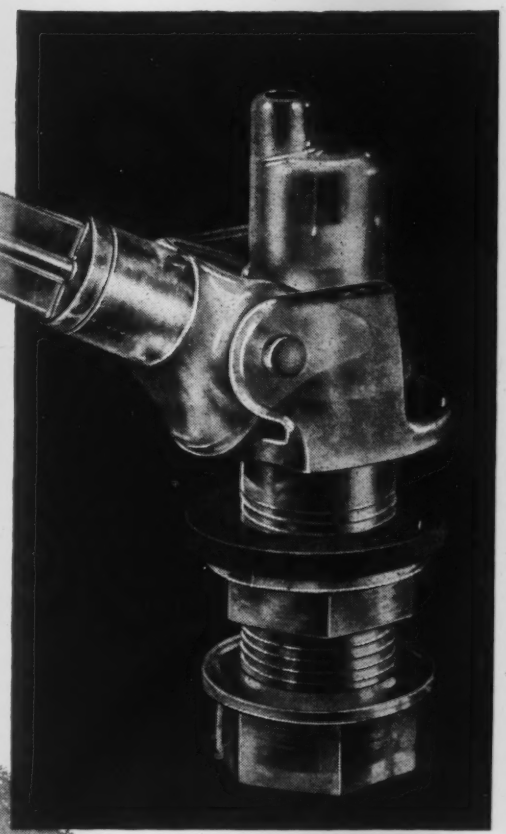
TRADE-MARK

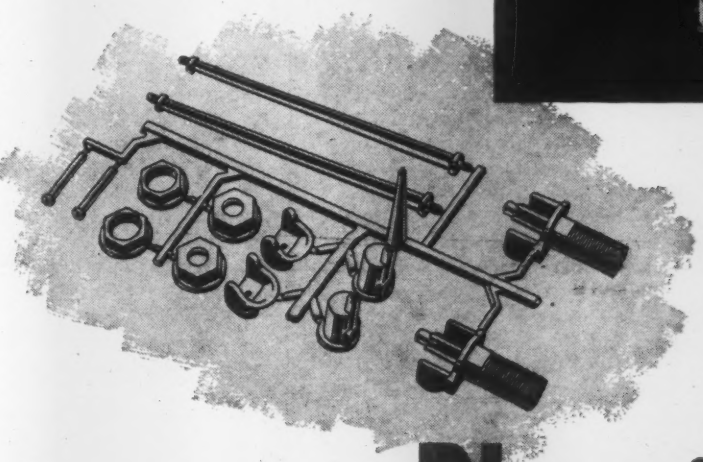
Two Moving Parts Instead of Twelve

THE NEW BALL-COCK VALVE molded of BAKELITE polystyrene plastics is a remarkable example of the result of revised thinking applied to an old product. The difficulty of making metal replacements for worn and corroded valves suggested the use of plastics. Plastics, in turn, called for a simplified, readily moldable design.

As redesigned, the new valve of BAKELITE polystyrene has only two moving parts as compared to some twelve in its metallic forebears. It takes but four ounces of polystyrene —a 90 per cent saving in weight, as former valves used 40 ounces of copper and brass. Parts for two complete units come from the injection molding machine on one sprue every 35 seconds. Threads are *molded* on the main connection and ball ends. Only female threads must be tapped by hand in the assembly units. Production costs are greatly lowered, for in metal valves each part had to be cast, machined, drilled, tapped, and male threads cut by hand, before assembly. And besides simplicity of design and ease of production, this plastic valve is thoroughly dependable, assuring long-term service. It is fully resistant to corrosion and scale, the chief troublemakers and causes of failure in the past.

This improved ball-cock valve shows the value of teamwork between designers, fabricators, and material suppliers. If you have a product that must resist corrosion, one of the many BAKELITE plastics is likely to be the answer. Other characteristics in the material might bring further improvements; and, of course, the use of plastics often reduces production costs. Our Field Engineers and Development Laboratories will be glad to work with you on essential problems at any time. Write for Booklet 13-M that describes BAKELITE molding plastics.





TRADE MARK

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Unit of Union Carbide and Carbon Corporation

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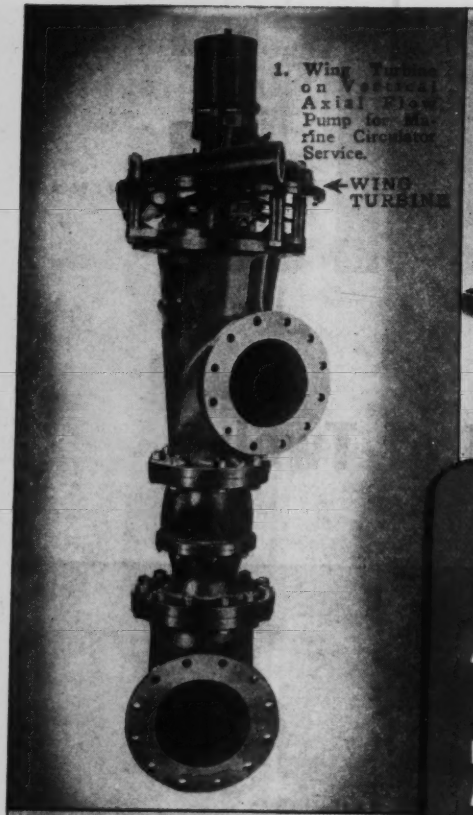
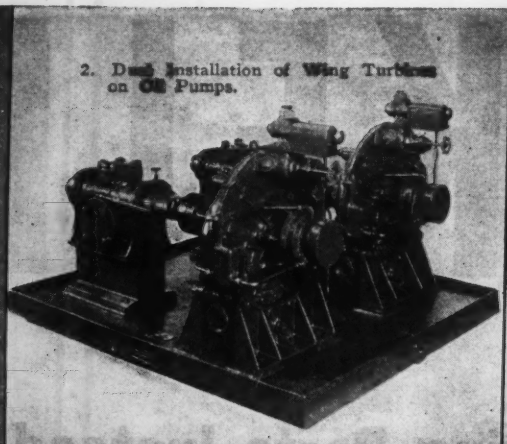
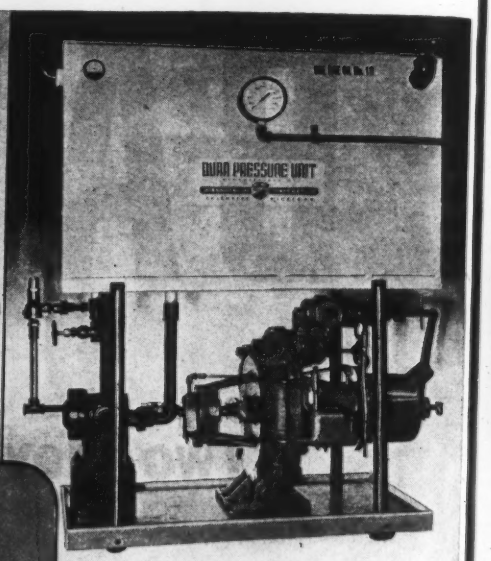
Polystyrene Plastics



1. Wing Turbine on Vertical Axial Flow Pump for Marine Circulator Service.



2. Dual Installation of Wing Turbines on Oil Pumps.



3. Compact arrangement of Wing Turbine on Special Oil Circulating System for Oil Field Service.

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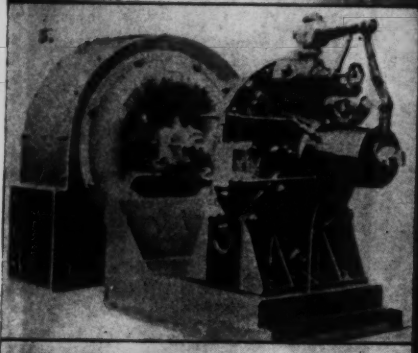

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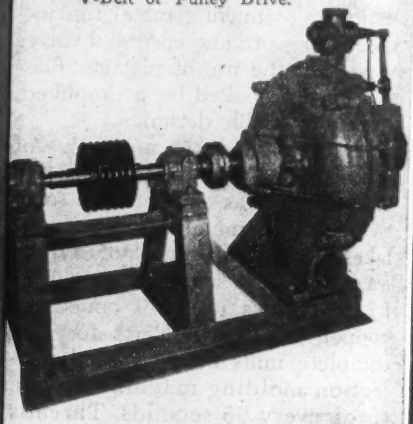
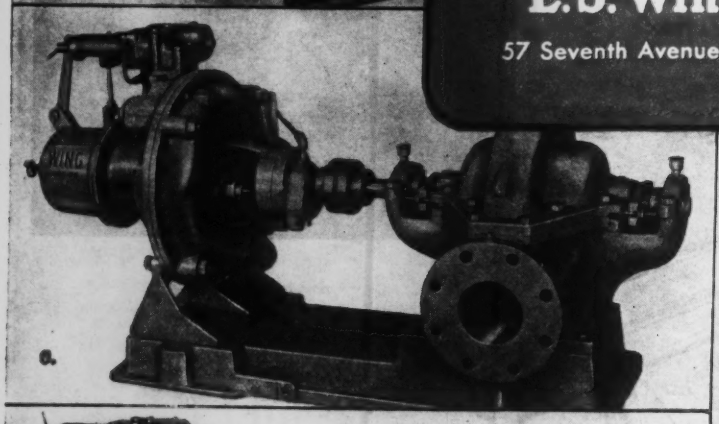
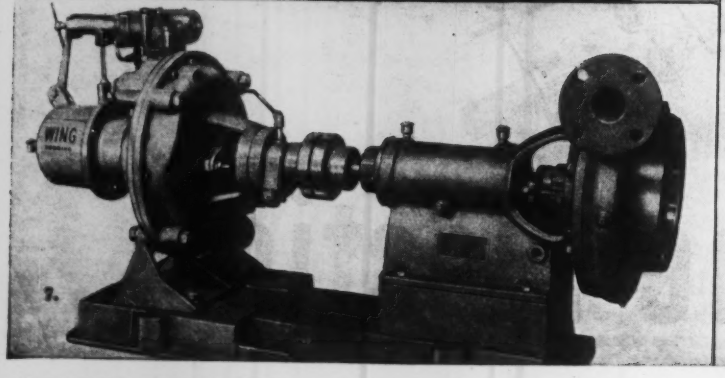


4. Flexible Coupled Jackshaft Arrangement for V-Belt or Pulley Drive.



8.

8. Wing Turbine Driven Draft Inducer for Marine Service where Low Head Room is required. Integral By-Pass is incorporated.



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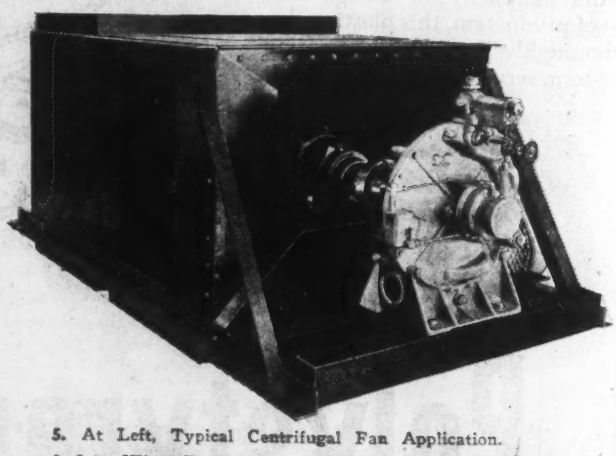
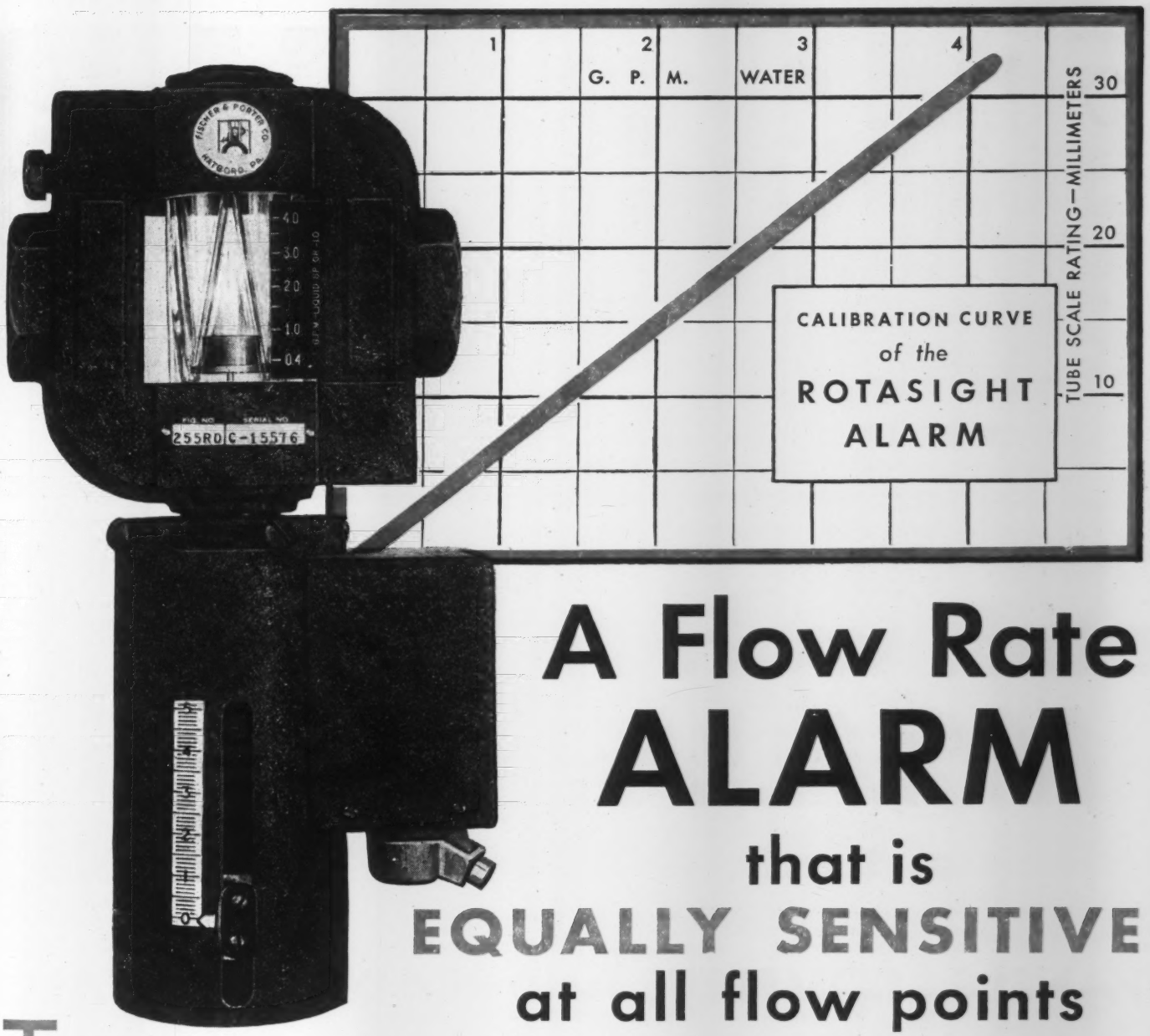


5. At Left, Typical Centrifugal Fan Application.

6. & 7. Wing Turbines on Main and Auxiliary Condenser Pumps for Marine Service.



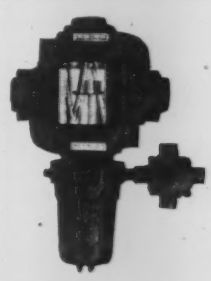
A Flow Rate ALARM that is EQUALLY SENSITIVE at all flow points

THE ROTASIGHT ALARM is an excellent flow rate alarm because the float, which actuates the alarm, responds to flow rate changes only. When we add, however, that the float reacts to flow changes with the same high sensitivity at all points in the flow range, it seems to justify the statement that the Rotasight Alarm is a *remarkable* flow rate protective device. The straight-line calibration curve, shown above, is typical of the Rotasight and proves that the float moves the same distance for a given flow increment at all points in the flow range, whether high or low. The result is a Flow Alarm that is positive and accurate at the exact flow rate where you desire protection.

The Rotasight is an area-type flow meter in which the float moves up and down in a precision-bore transparent metering tube fashioned with unique V-ported flutes. All of the flow goes through the meter and the float trips an external magnetic switch at the alarm point. The external switch is adjustable easily and quickly to any point over the entire flow range of the instrument.

The Rotasight is cast in iron and bronze in sizes from $\frac{1}{4}$" to $2\frac{1}{2}$" inclusive. It will handle minimum flows of 0.03 G.P.M. of liquid and 0.06 C.F.M. of gas, and maximum flows of 60 G.P.M. of liquid and 135 C.F.M. of gas. Larger flows up to 14,000 G.P.M. liquid or 16,000 C.F.M. gas may be metered in our Rotasleeve Alarm.

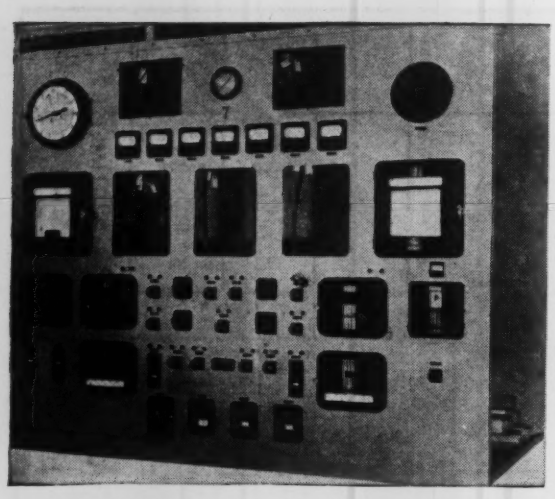
Leading manufacturers are using the Rotasight Alarm to protect expensive machinery and critical products. The full details are contained in an interesting new booklet 92-C, just off the press. You may obtain a free copy by writing us for it upon your Company letterhead.



The Rotasight Alarm may be equipped with explosion-proof switch housing for hazardous locations.

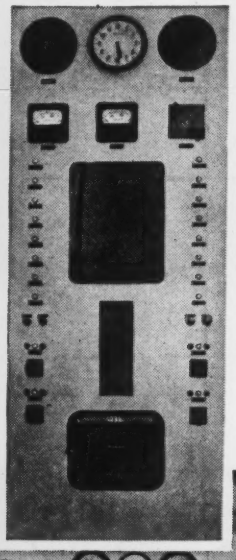
FISCHER & PORTER CO.

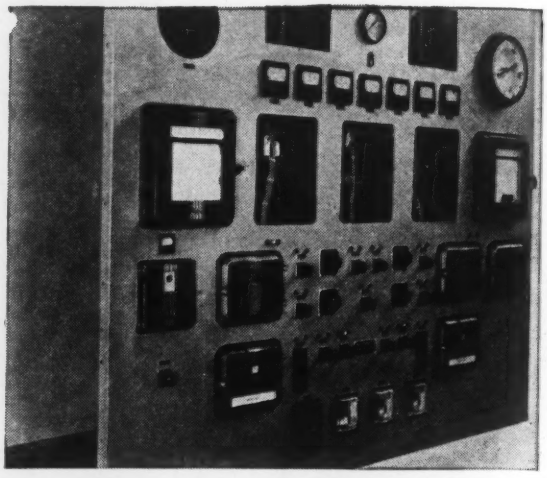
712 County Line Road, Hatboro, Pennsylvania



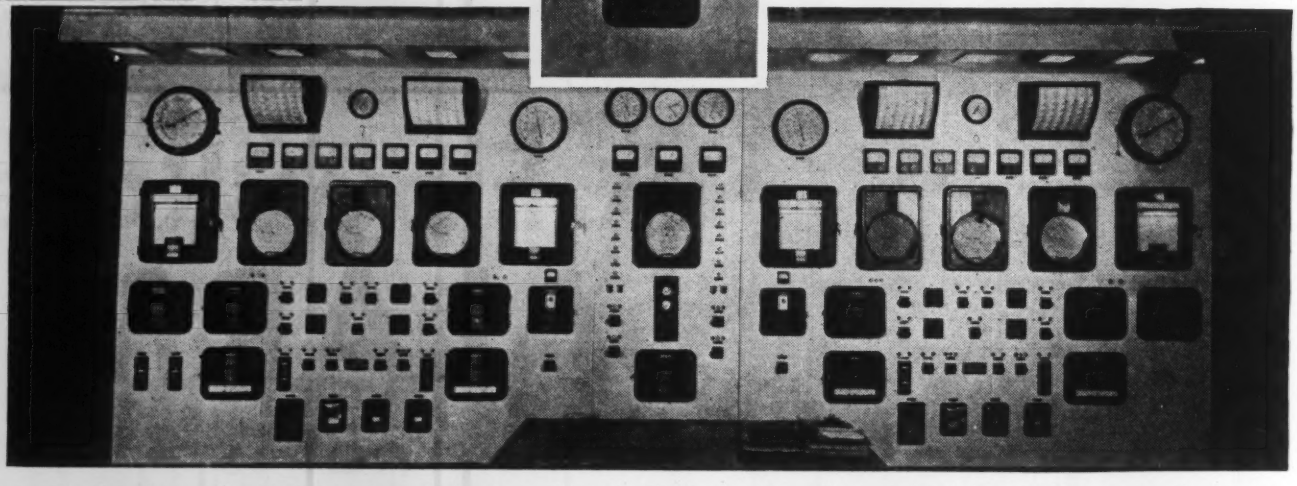
Ready for shipment—left section of panel shown below.

Center section, showing signals and accessories.





Right section, before delivery. Note wired cutouts.



Complete 3-section panel—with illuminating hood attached, wired and labelled cutouts (shown above) mounted with desired instruments.

Designed and supplied by L&N for Pennsylvania Electric Company's Front St. Station, Erie, Pa.

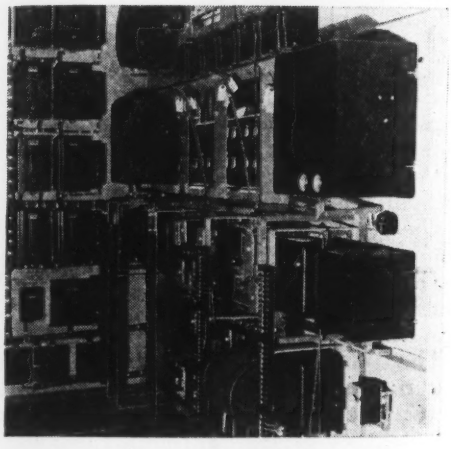
PANELS...COMPLETE AND READY TO INSTALL

This boiler-control panel for "Penelec" in Erie, Pa., demonstrates two of the features we put into every one of the many panels we build:

1. Its instruments and controllers, switches, signals and all accessories are grouped for the greatest convenience of the boiler operator. As makers of Metermax Combustion Controllers, Micromax Superheat Controllers, Micromax Recorders for CO_2, temperature, smoke, conductivity, pH, frequency, etc., we are well equipped to design the most efficient and practical panel for your plant's particular problem.

2. Panels reach you ready to install. Most instruments and controllers are in place; wiring is entirely completed and factory-tested. Instruments which we do not make can be supplied on request, or cutouts, wired and labelled, can be left for them, as was done on the panels shown above.

When you buy new instruments, consult an L&N engineer about another important L&N service—the supplying of control panels.



Rear view of L&N built panel—every wire neatly run and every connection checked.

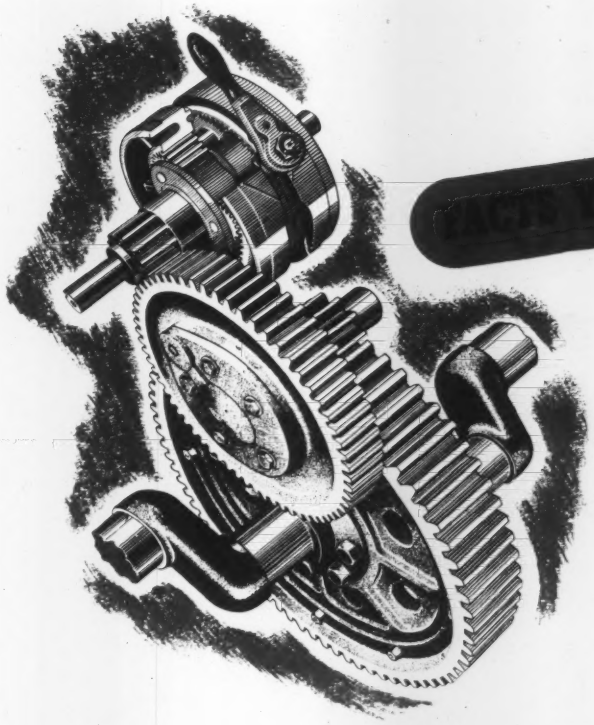
V depends on me!
A Slogan For Every American

Jrl. Ad. NU-52(1)

LEEDS & NORTHRUP COMPANY, 4963 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES



FACTS YOU SHOULD KNOW ABOUT THIS—

SPUR GEAR PLANETARY DRIVE

THE TAYLOR STOKER 2-speed Power Box, an all spur-gear planetary transmission, transmits the power to operate the main coal feeding rams, and the fuel distributing members.

It provides two speeds and a neutral position.

Speed changes are made with gears in mesh at all times. No disengagement of gears is required. No clutches, thrust washers, thrust bearings or stuffing boxes are employed in this unique all-spur gear planetary transmission.

Simplified construction results in lower maintenance costs, and more efficient transmission of power.

The spur gear planetary construction now employs a triple gear cage pinion which results in a more balanced drive with minimum wear on the component gears of the entire transmission.

There are 6 other distinct advantages of the Taylor Stoker Power boxes:

- The entire drive is protected by an easily accessible shearing pin.
- Outer rim of main gear is renewable, easy and economical to replace.
- Oil return device keeps oil level in upper casing constant.
- Bushed bearings.
- Design permits motor to be mounted right on power box to form a compact driving unit.
- A steam turbine may be furnished as an integral part of the Taylor Power Box—giving a 10 to 1 speed range.

The Taylor Power Box is only one of numerous features which make the Taylor Stoker advisable for efficient low cost steam generation.

JUDGE THE SELECTION OF FUEL FIRING EQUIPMENT BY THESE TWELVE POINTS

1. RELIABILITY—the ability to operate with minimum outage and minimum standby equipment.

2. CAPACITY—the ability to provide adequate prime capacity ratings, with sufficient reserve capacity for emergencies.

3. MAINTENANCE—the ability to operate continuously with minimum repair costs.

4. FLEXIBILITY—the ability to follow the steam demand upward or downward . . . quickly and without sacrificing efficiency.

5. EFFICIENCY—the proved dollar efficiency (total cost of steam production) as shown by actual performance in similar installations.

6. OPERATION—the ability to operate continuously, the number and type of operations required, the ease of combustion adjustments, etc.

7. ADAPTABILITY—the ability to meet special and limiting conditions, present and future—structural limitations, utilization of present equipment, growth and change of power service demands.

8. FUEL FLEXIBILITY—the ability to burn efficiently and easily fuels from many sources having widely varying characteristics.

9. REFUSE DISPOSAL—the ability to economically eliminate ash or refuse and the opportunities of disposal at low cost, no cost, or profit.

10. STACK DISCHARGE—the practical elimination of "smoke nuisance" without special equipment.

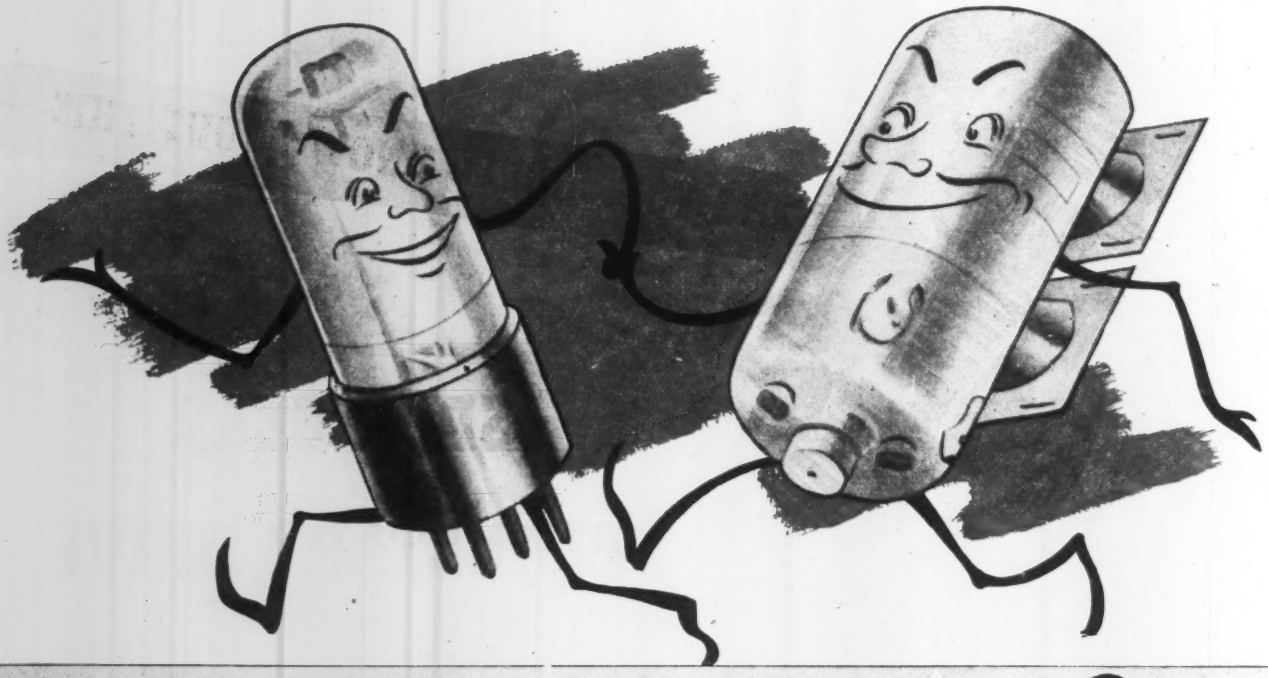
11. SPACE REQUIREMENTS—the ability to conform to existing or future space limitations, to short and wide or long and narrow furnaces. Also the accessibility of component parts for maintenance and operation.

12. OBSOLESCENCE—the adaptability of the equipment toward possible future modernization with minimum of complication and outage.

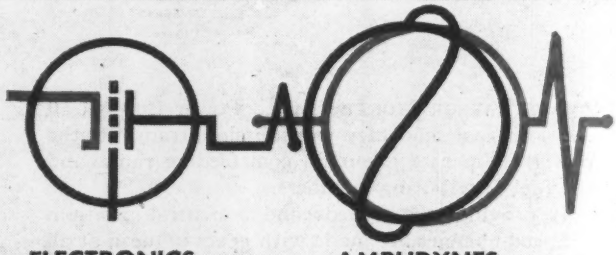
A-E-CO TAYLOR STOKERS • LO-HED HOISTS
HELE-SHAW FLUID POWER • MARINE DECK AUXILIARIES

AMERICAN ENGINEERING COMPANY

PHILADELPHIA 25 • PENNSYLVANIA



What will this pair do next?



GUN turrets, ship steering mechanisms, paper-machine drives, steel-mill flying shears—these are examples of where the partnership of electronic tubes and G-E amplidynes is *already* doing several important control jobs.

To picture the possibilities *ahead*, consider how this unusual partnership works:

First, the milliwatt output of a phototube, selsyn, resistor, tachometer, or other sensitive measuring device is amplified electronically to about one watt. Thus, your original signal may be initiated by a light, color, or temperature; by motion; or by changes in power or speed.

Second, this one-watt current gets another powerful boost (is multiplied 10,000 times or more) from the G-E amplidyne, which thus furnishes the kilowatts required to drive or control industrial machines. Because of the extremely fast and accurate response of both electronic tube and amplidyne, the slightest change in the original milliwatt signal causes a corresponding, precisely proportioned change in the amplidyne's kilowatt output.

This means that machine tools, continuous processes, materials handling—to say nothing of countless steering or positioning operations—can be made more automatic and more precise, and with fewer parts, than was ever before thought possible.

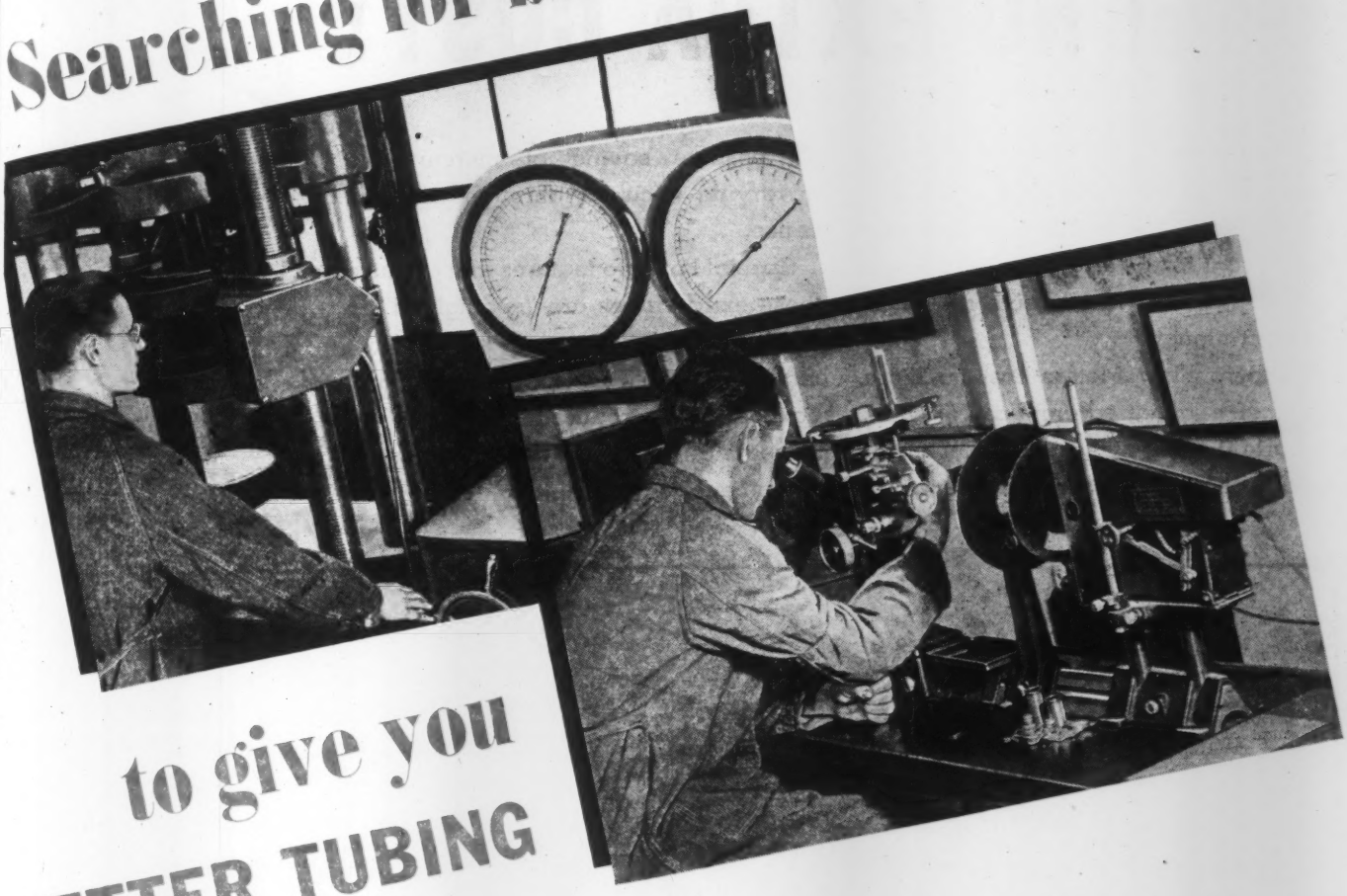
To help you use the amplidyne in harnessing the magic of electronics to industrial needs, we've prepared a booklet which explains how the amplidyne works, and shows where it has been—and can be—applied. Ask for Bulletin GEA-4186. *General Electric Company, Schenectady 5, N. Y.*

Buy all the Bonds you can
and *keep all you buy*

GENERAL ELECTRIC

AMPLIDYNES

Searching for better alloys...



to give you BETTER TUBING

Ever since B&W produced first seamless alloy steel tubing commercially back in 1922, it has continued to pioneer important improvements in tubing for high temperature, high pressure, oxidation and corrosion-resistant services. Day in day out in B&W large, complete tube laboratories, engineers and technicians are diligently and constantly searching for better alloys or how to improve present alloys that will extend the life, reduce maintenance, and increase dependability of tubing in refineries, synthetic rubber plants and chemical plants.

Today B&W seamless tubing is available in a complete range of alloy steels. *That means there's a B&W tube for any refinery need.*

Improvements being made in seamless tubing at B&W are available for both your present and future requirements. More and more tube users are taking advantage of B&W tube engineering and production facilities these days. Reason is B&W is in position to match tubes to jobs without prejudice toward any type. By bringing your tube problems to B&W you also centralize your purchasing problems.

B&W TUBES

SEAMLESS. Complete range of carbon and alloy steels. Sizes: ½ in. to 8⅝ in. O.D.

ELECTRIC-Resistance Welded Carbon grades. Sizes: ¾ in. to 4 in. O.D.

THE BABCOCK & WILCOX TUBE COMPANY

Seamless Tube Division, Beaver Falls, Pa. — Welded Tube Division, Alliance, Ohio

B & W MAKES BOTH

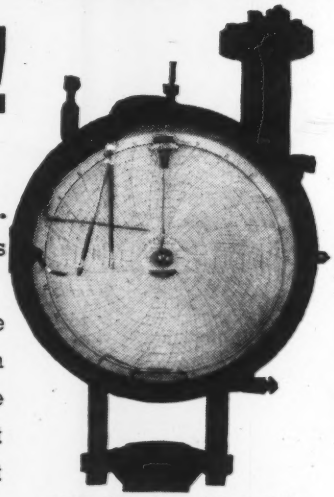
TA-1300

All these EXTRA METER VALUES at NO EXTRA COST!

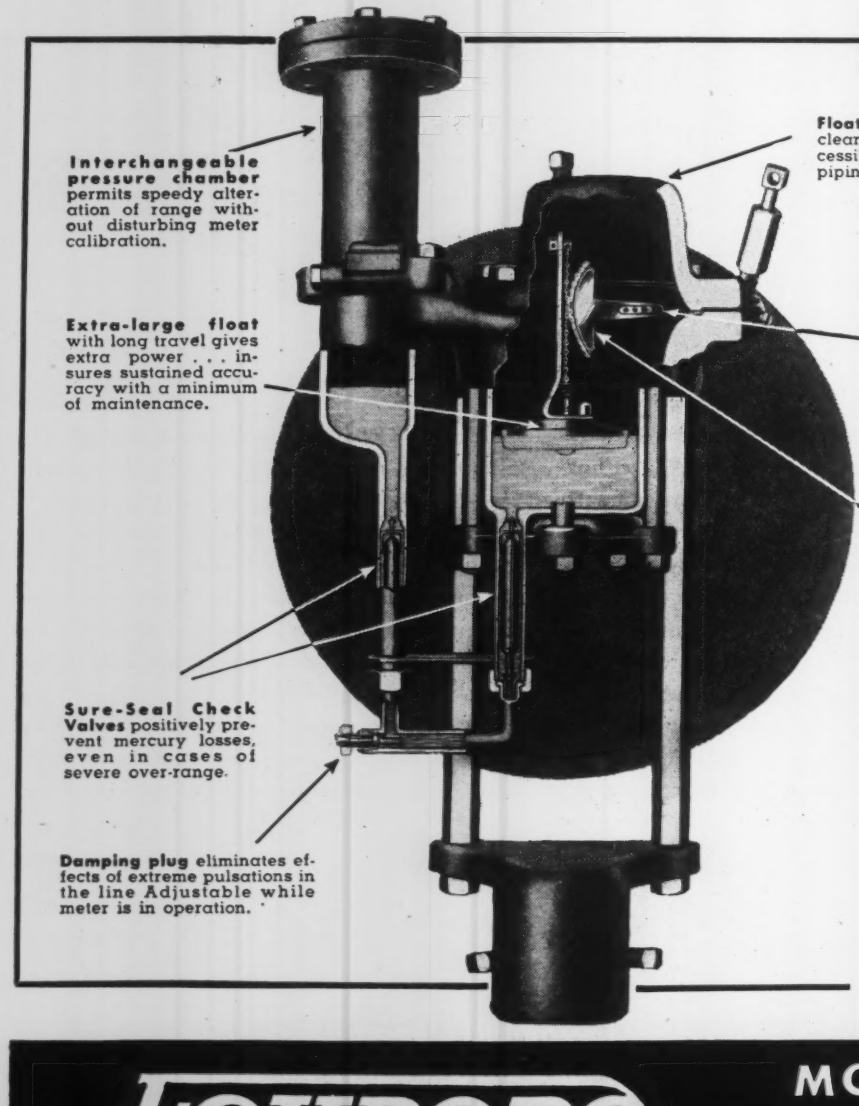
It's just plain "good business" to make sure you get full value from your meter investment. Over 45,000 installations of Foxboro Flow Meters have demonstrated that these meters give you "more for your money!"

Foxboro Flow Meters cost no more. Yet, their *engineered simplicity* provides important extra values . . . easier installation . . . simpler, less-frequent servicing . . . positive saving of mercury . . . unvarying accuracy throughout years of use.

Special Foxboro features that produce these extra values are "spotlighted" in the illustration. They are some of the major advances in meter design that Foxboro has introduced during the last 30 years of leadership in flow meter development and installation.



FOXBORO TYPE 7000 FLOW METER Available with integrator, automatic control mechanism, extra pens for temperature and pressure.

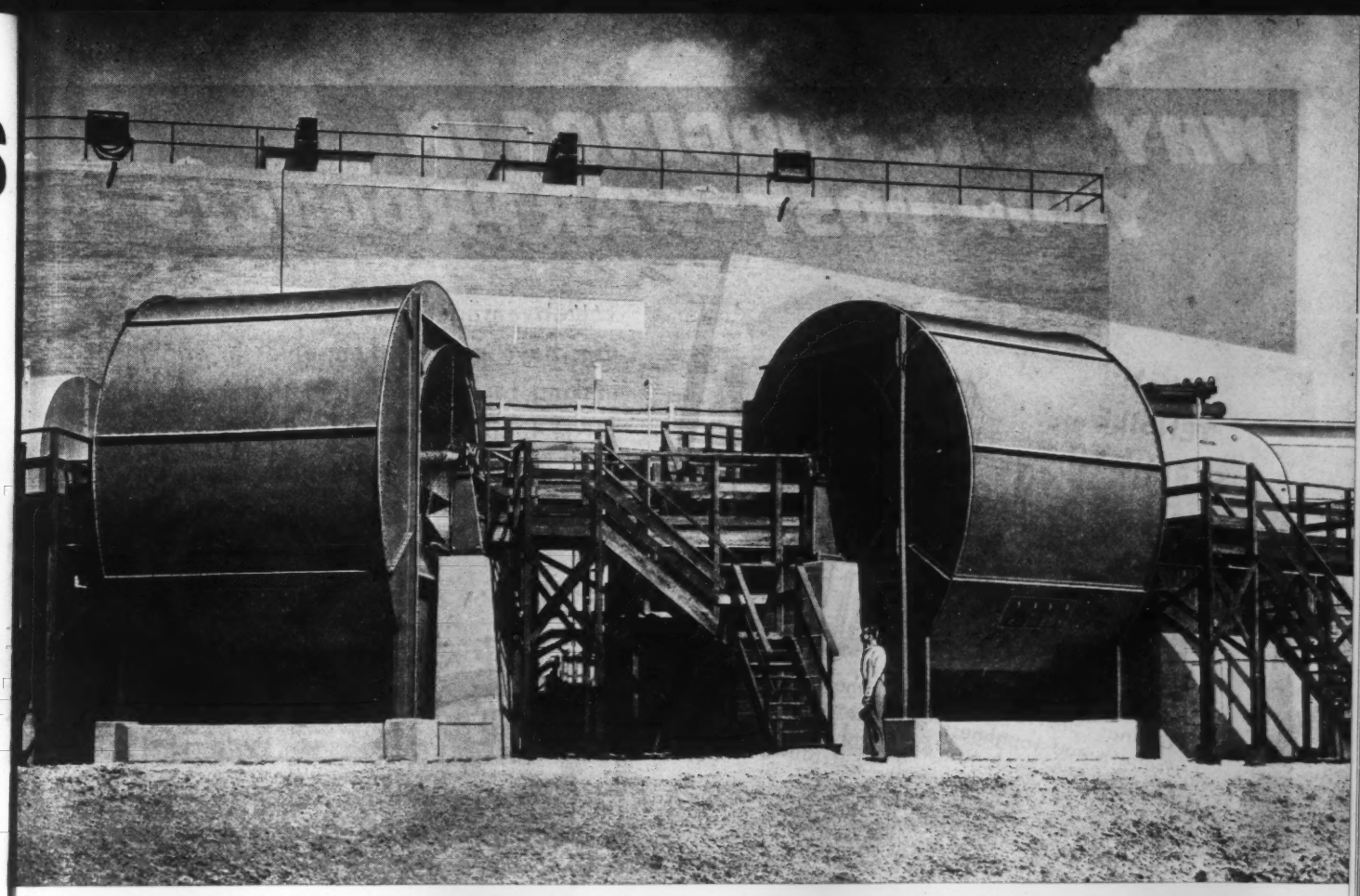


Foxboro Flow Meters are made in recording, controlling, indicating and integrating models for all needs of process industries, gas suppliers, power plants and water works.

Foxboro engineers will be glad to place their specialized knowledge of flow measurement at your service for better metering installations. Write for detailed information. **The Foxboro Company, 182 Neponset Avenue, Foxboro, Massachusetts, U. S. A.** Branches in principal cities.

FOXBORO REG. U. S. PAT. OFF.

MONEY-SAVING FLOW METERS



"Fan Engineering" 4th edition, handbook of the air engineer for more than 30 years, covers all details of theory and practice of handling and tempering air and gases. 740 pages, bound in limp black Fabricoid, $4.00 postpaid in U. S. A.

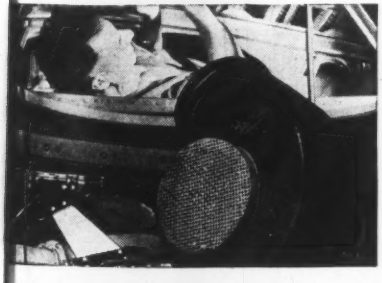
BIG AS ALL OUT-DOORS

Above are two of a number of Buffalo fans built recently for a chemical manufacturer. Installed out-of-doors, these huge fans operate with little attention, each handling over 864,000,000 cubic feet of air every 24 hours.

A service man, checking on the job, reports as follows:

"These fans are more than coming up to expectations. They expected to increase their output by approximately 20% by the installation of the fans, but they are actually increasing it about 29%."

"Buffalo" fans are built to give you that extra margin of fine performance which means a job well done. When you need air-moving or conditioning equipment of any kind ... let Buffalo representatives (in all principal cities) make recommendations.



SMALL as you need . . . In contrast to the outdoor Goliaths shown on this page, the little Buffalo Baby Conoidal Fan above is supplying cool fresh air to a workman inside a bomber wing. Hundreds of these fans are used by airplane manufacturers for this service. For every fan application . . . there's a Buffalo fan of the right characteristics!

"Buffalo" "First For Fans"

BUFFALO FORGE COMPANY

BUFFALO New York

BUFFALO PUMPS, INC. • THE GEO. L. SQUIER MFG. CO.
CANADIAN BLOWER & FORGE CO. LTD. • CANADA PUMPS, LTD.

Buy WAR BONDS

WHY MORE FORGINGS IN YOUR POST-WAR PRODUCTS?

The advantages of the broader use of forgings have proved themselves in armament making to such an extent that the nation's forge facilities were taxed to their utmost during the peak war production period. These same advantages are being utilized by designers of postwar machines and equipment.

HIGH TENSILE STRENGTH

Forgings provide metals at their ultimate strength and toughness, with maximum resistance to tensional, torsional and compression stresses; obtained through controlled grain flow, resulting from the forging process. Forged parts also embody the high fatigue resistance which results in longer service life.

SAVINGS IN WEIGHT

The forging process produces maximum strength, permitting use of thinner metal sections, resulting in parts of less weight. Valuable space may also be saved. These are important considerations in many postwar machines.

LOWER MACHINING COSTS

With the close tolerances obtainable by modern day methods, forgings generally require less time to machine and finish; resulting in reduced machining and tool costs.

GREATER SAFETY

The fracture of a part is too often accompanied by a serious accident. The use of forgings for stressed parts affords the highest safety factor.

At Kropp Forge, facilities for essential civilian forgings are becoming available as our war assignments are completed.

When you need flat die, drop or upset forgings, call the nearest Kropp engineering representative, or write direct for information or quotation.

KROPP FORGE COMPANY
5301 W. Roosevelt Road, Chicago 50, Ill.
Engineering Representatives In Principal Cities

SERVING INDUSTRY 18 SINCE 31 OVER 100 YEARS — KROPP FORGE CO

KROPP

ARMY E NAVY

Yarway Impulse Traps

For Pressures Up to 1500 lbs

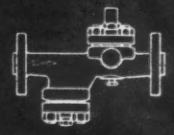


Fig. No. 140 to 147. Medium pressure integral-strainer Impulse Trap for pressures up to 600 lb. Steel body, flanged connections.

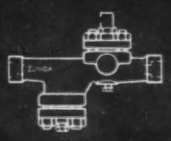


Fig. No. 250 to 257. Medium pressure integral-strainer Impulse Trap for pressures up to 600 lb. Steel body, socket weld connections.

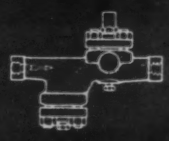


Fig. No. 410 to 417. Low pressure integral-strainer Impulse Trap for pressures up to 150 lb. Bronze body, screwed connections.

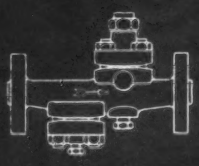
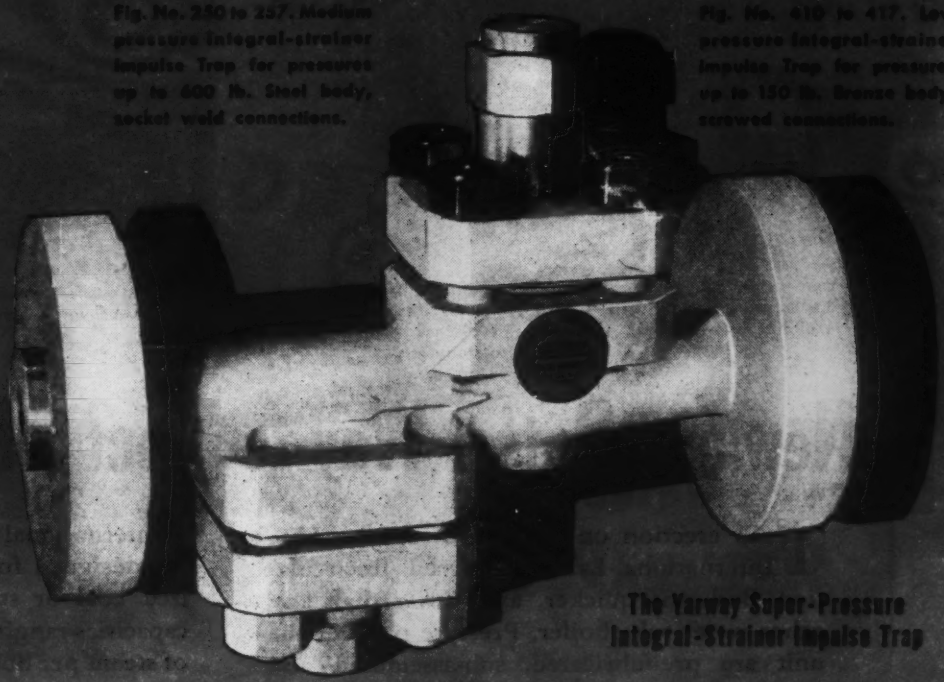
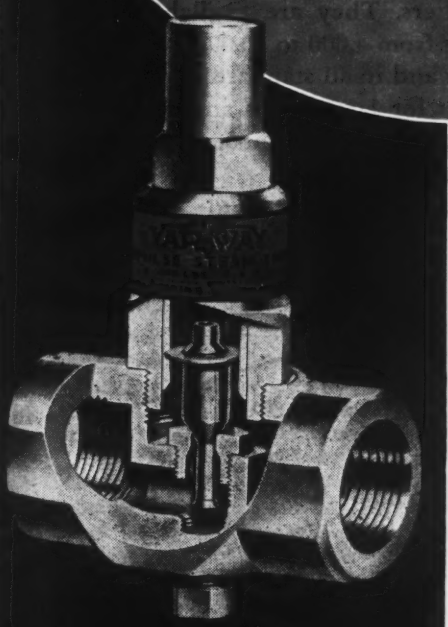


Fig. No. 150 to 157. Super-pressure integral-strainer Impulse Trap for pressures up to 1500 lb. Steel body, flanged connections.



The Yarway Super-Pressure Integral-Strainer Impulse Trap



The Standard Yarway Impulse Trap. Note only one moving part — a little valve.

ALONG with the remarkable success of the YARWAY IMPULSE TRAP for standard trapping service (more than 250,000 have been purchased), has come its use in steam plants where pressures as high as 1500 lbs and temperatures as great as 900°F are encountered.

The integral-strainer trap shown above, developed for this service is suitable for every drainage requirement in high pressure steam installations. It has ample condensate capacity when system is being "warmed up". It will handle relatively small amounts of high temperature condensate, efficiently, without losing its prime.

The valve closes positively in the presence of dry or superheated steam.

It is a fraction of the size and weight of other type traps designed for the same service—saving space, simplifying installation and requiring no support.

It is suitable for all pressures within a wide range without change of valve or seat.

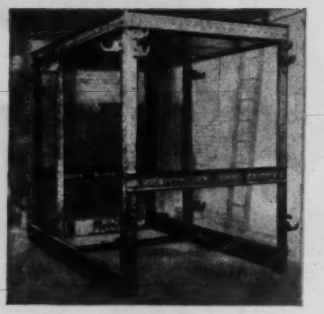
It has the same simplicity of design as does the standard Impulse Trap—only one moving part, a little valve.

Its integral-strainer protects the trap against scale and rust in the system.

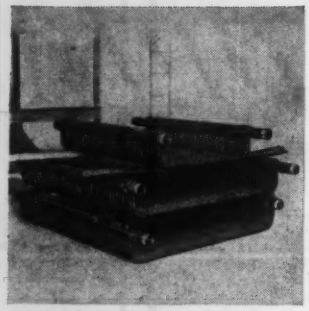
For complete description of operating principle, send for Bulletin T-1738.

YARNALL-WARING COMPANY, 108 MERMAID AVE., PHILADELPHIA 18, PA.

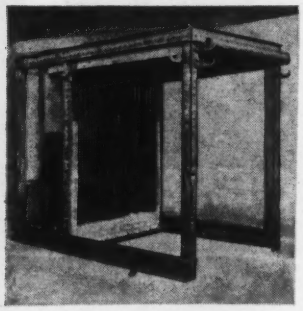
YARWAY IMPULSE STEAM TRAP



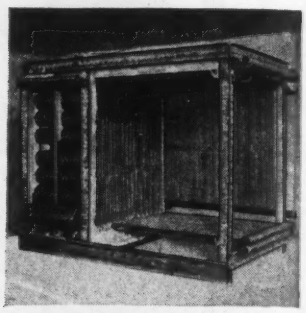
Boiler frame or structural frame work.



Front and side furnace water-wall sub-assemblies ready to be hung on structural frame work.



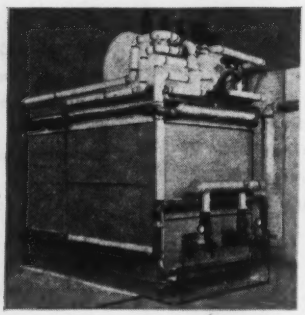
Rear and roof furnace water-wall installed. Roof, bridge wall, baffle and rear insulated casing in place.



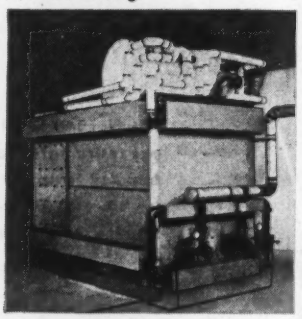
Convectors, rear, roof and side furnace water-walls, with special floor water-wall for oil or pulverized coal firing.

Furnace water-walls and convectors erected, steam drum in place showing insulated steel casing detail.

Boiler enclosed, insulated steel casing showing water-wall and convector discharge piping connected to steam drum.



Boiler ready to be fired but headers and tubes uncovered showing ease of inspection.



Boiler completely enclosed with insulated header boxes in place.

A New and Better Way to Erect a Boiler on the Job

THE erection on the job of a Type LFS, International-LaMont Forced Recirculation Boiler is quicker, and easier than any other water tube boiler. Pressure parts of the unit are pre-fabricated, sub-assembled and tested in the shops before shipment. Other parts are sub-assembled and checked for quick erection on the job. In small sizes, the boiler unit can be shipped completely assembled.

Other distinctive features of the Type LFS Boiler are:

The boiler is in complete circulation before the fire is started.

The steam drum is an unfired pressure vessel.

Higher efficiencies due to maximum radiant heat absorbing surface in furnace water-walls and effective arrangement of secondary heating surfaces.

Extreme flexibility—follows swinging load from no load to maximum load instantaneously.

Steady water line and dry steam under all load conditions.

Minimum space requirements—low headroom a feature.

International-LaMont Boilers*, Type LFS, are designed for firing with oil, gas, pulverized coal or stokers. They are available in capacities ranging from 4,000 to 30,000 pounds of steam per hour and in all standard working pressures. Designs for larger sizes and special pressures or superheat requirements on request.

Write today for bulletin illustrating and describing special features of this Type LFS Boiler.

*Licensed under LaMont patents.

TYPE FR 20 to 300 h.p. Shipped complete for connection to electric, fuel oil and fresh water supply lines.

TYPE LFR 20 to 100 h.p. Shipped complete for connection to electric, fuel oil and fresh water supply lines.

TYPE CR Firebox Water Tube Boiler 100-125-150 lb. A.S.M.E. Standard 10 to 300 h.p. Also a complete line of welded firebox water tube heating boilers. 15 lb. A.S.M.E. Standards.

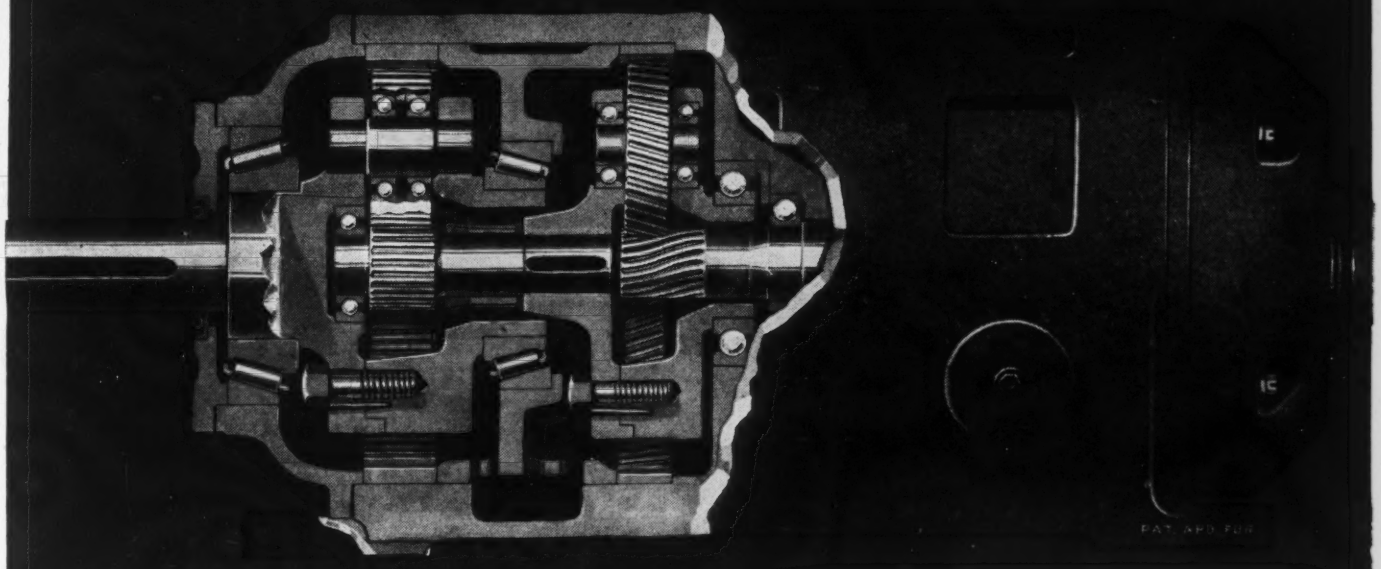
Boiler Builders for **58** Years

THE INTERNATIONAL BOILER WORKS CO.

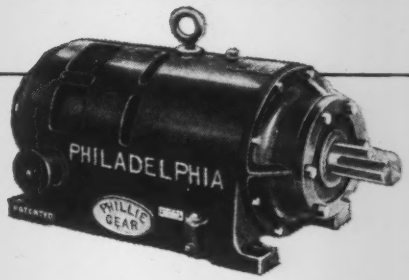
POWER DIVISION

260 BIRCH STREET • EAST STROUDSBURG, PA.

NO OVERHUNG PARTS



Philadelphia
MOTOREDUCER



...Drive operates without Vibration

Both the horizontal and vertical MotoReduceR combine a motor and planetary speed reducer in a single housing. This results in an attractive streamlined effect that enables the MotoReduceR to blend with, and appear to be an integral part of any machine on which it is installed. More important though is the resulting better alignment of pinions and gears, which reduces noise and wear and conserves space. *Because there are no overhung parts, vibration is eliminated and proper tooth alignment is maintained at all loads.* All parts, however, are readily accessible.

The MotoReduceR will operate efficiently for years, without any attention except periodic changes of lubricant.
A wide range of sizes and ratios are available with standard A.G.M.A. ratings.
For complete information ask for catalog MR. 40 . . . on your business letterhead please.

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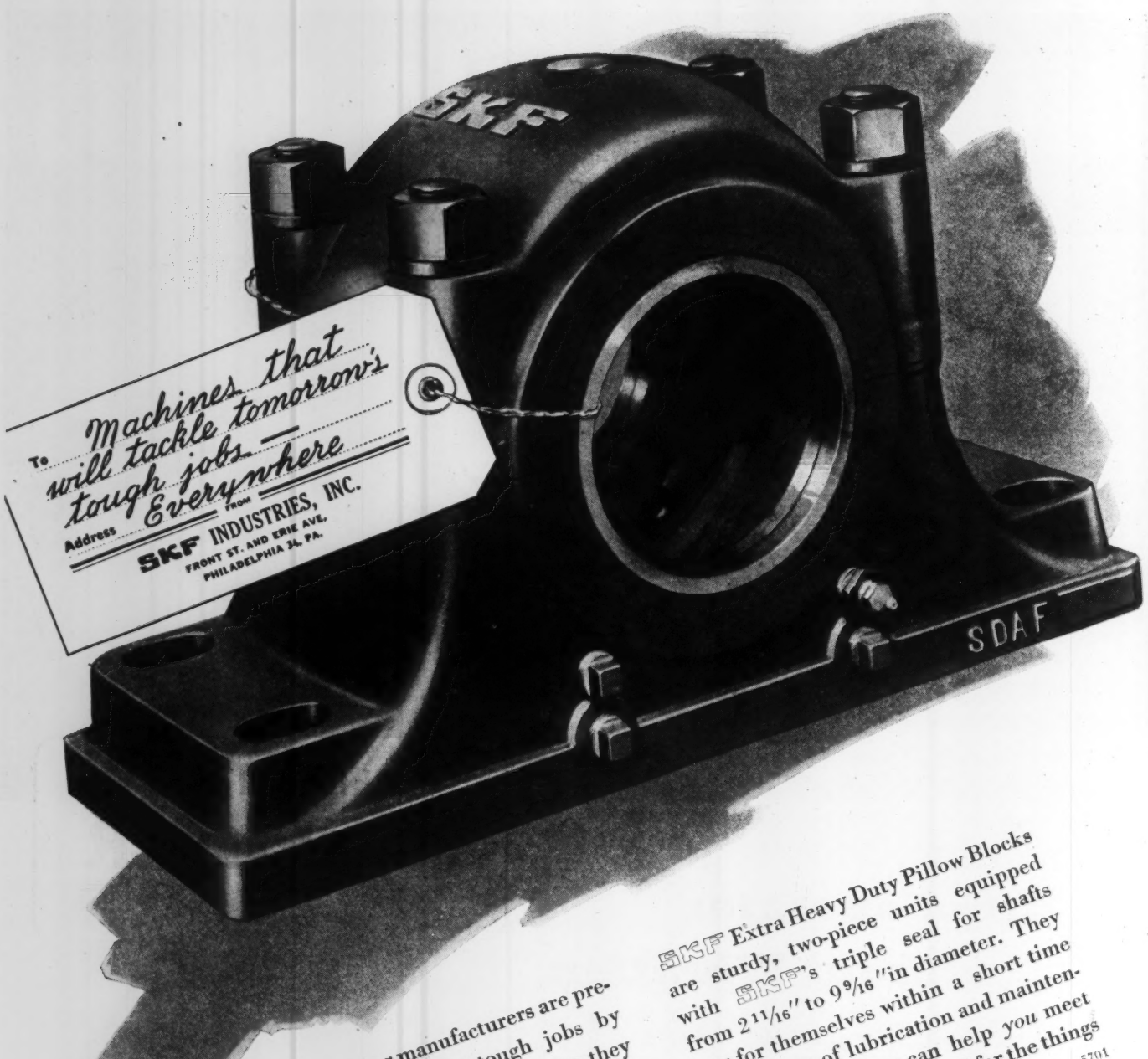
GEAR WORKS INCORPORATED
ERIE AVE. AND G ST., PHILADELPHIA 34, PA. NEW YORK • PITTSBURGH • CHICAGO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls



Forward-looking manufacturers are preparing for tomorrow's tough jobs by liberally equipping the machines they make with SKF Ball and Roller Bearings . . . by protecting these bearings against lubricant leakage and dangers from dirt and liquid with SKF Pillow Blocks.

SKF Extra Heavy Duty Pillow Blocks are sturdy, two-piece units equipped with SKF's triple seal for shafts from $2\frac{11}{16}$" to $9\frac{9}{16}$" in diameter. They pay for themselves within a short time in the form of lubrication and maintenance savings. They can help *you* meet the overwhelming demand for the things you will soon produce.

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SKF INDUSTRIES, INC., FRONT ST. & ERIE AVE., PHILA. 34, PA.

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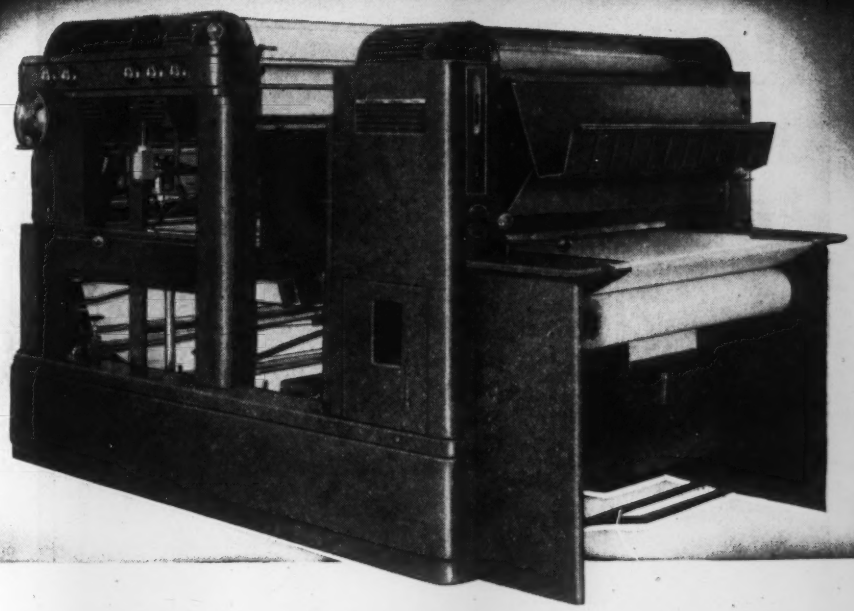
BEARINGS

PUT YOUR RECONVERSION PLANS IN ACTION QUICKLY

WITH LOW COST *Blueprints*



PEASE "22-16" Continuous Blueprinting and Processing (Washing, Developing and Drying) Machine has an actual production speed of 20 feet per minute.

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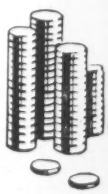
Quality



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RECONVERSION will not be a mere return to prewar production . . . The use of new materials and new methods will increase the demand for high quality Blueprints delivered quickly at low cost.

PEASE BLUEPRINTING MACHINES will provide these necessary Blueprints in volume and on time. Unparalleled in performance, fast and economical in operation, they require less attention and make sharper, clearer, more contrasty prints than any other tracing reproduction machine. Pease Blueprinting Machines are noted for their speed (Pease "22", not illustrated, produces prints at 30 feet per minute or more) and for their low cost, quality production . . . fine prints as low as one cent (or even less) per square foot.

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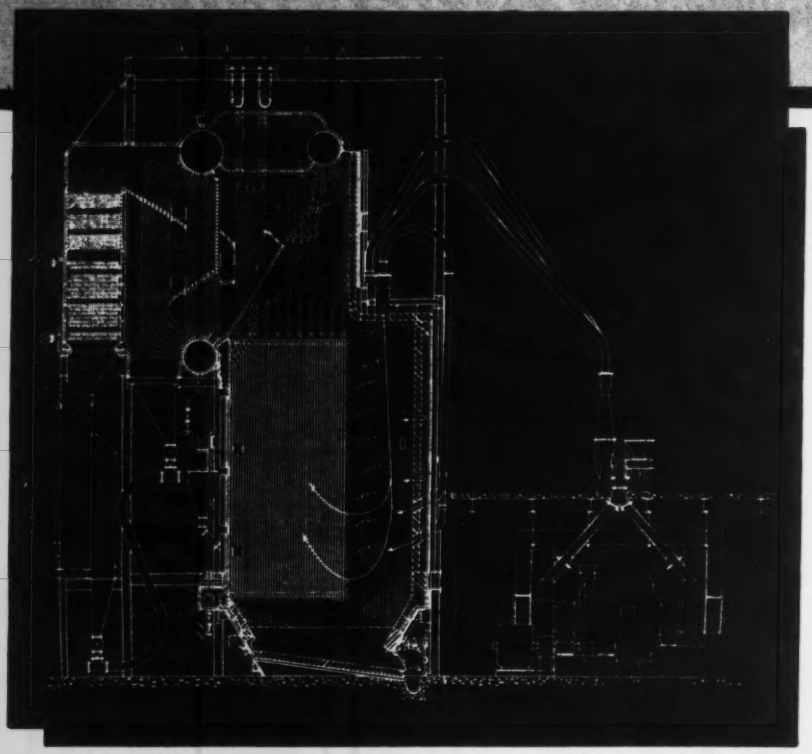
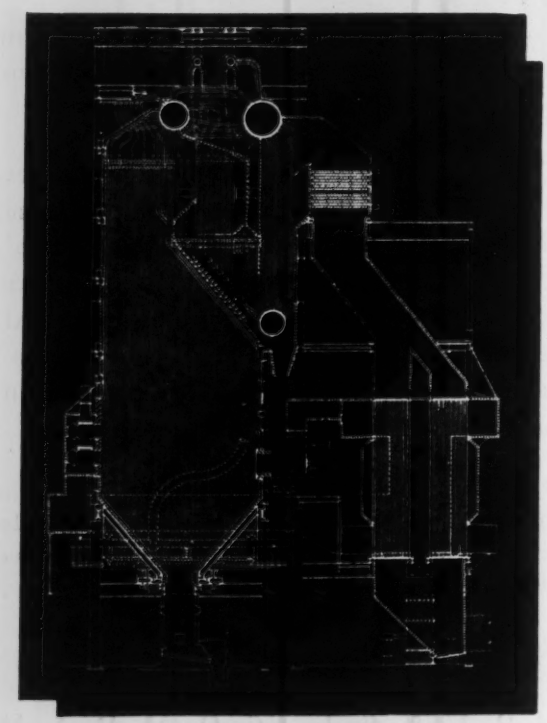
Pease Blueprinting Machines for all kinds of Tracing Reproductions

STEAM GENERATORS

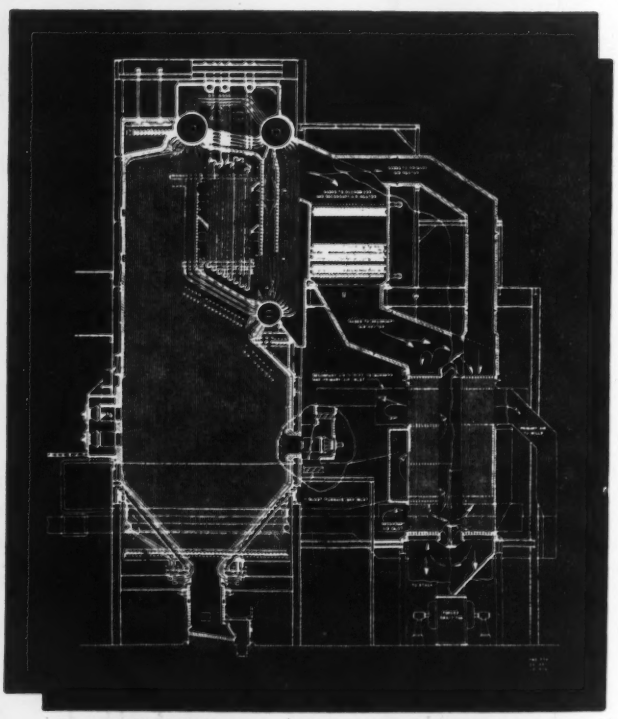
CAPACITIES



Capacity 165,375 lb. steam per hour, pressure 900 psi and final steam temperature 788 deg. F. Fuel: pulverized coal.



Capacity 385,000 lb. steam per hour, pressure 1050 psi and final steam temperature 900 deg. F. Fuel: pulverized coal and blast furnace gas.



Capacity 500,000 lb. steam per hour, pressure 1050 psi and final steam temperature 900 deg. F. Fuel: pulverized coal and blast furnace gas.

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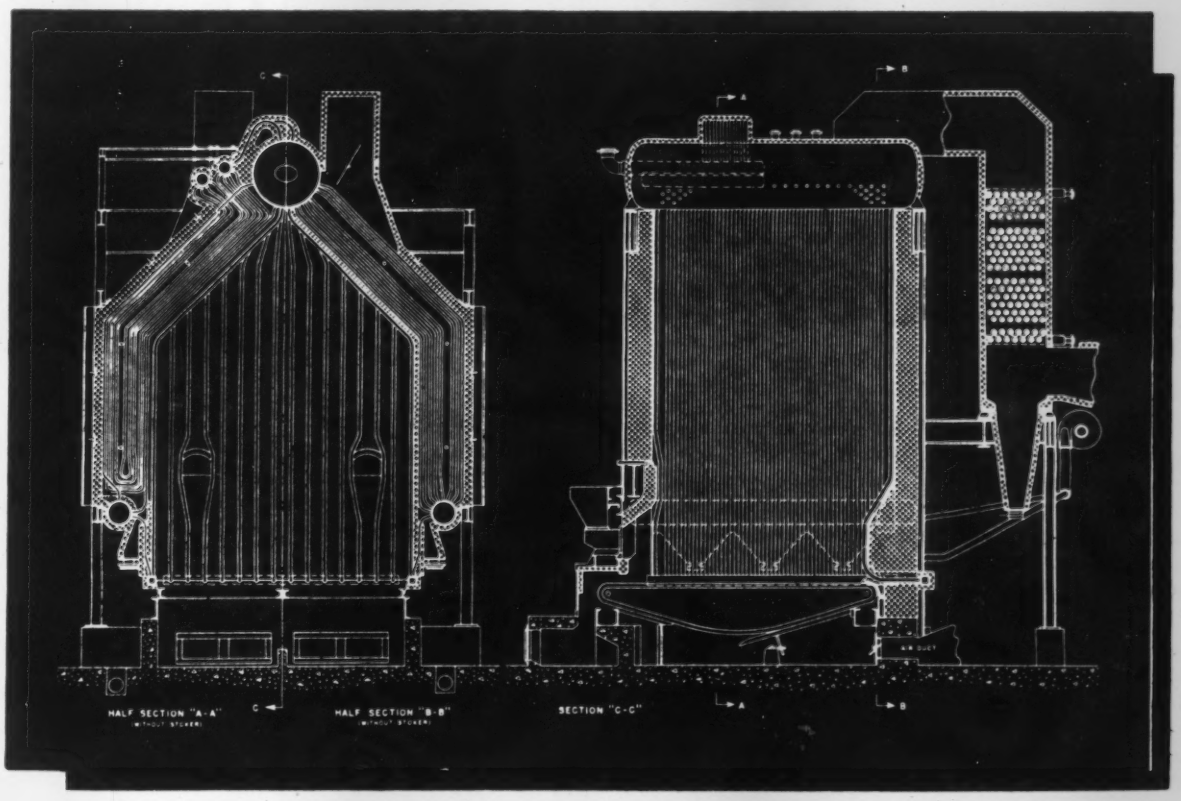
FOR RUSSIA ...

66,000 TO 500,000 LB. STEAM PER HOUR

THE steam generators shown in the accompanying drawings represent 23 of the many boilers that Foster Wheeler has designed and built for Russia during the past two years.

Their capacities range from 66,000 to 500,000 lb. steam per hour, with pressures from 315 psi to 1050 psi and final steam temperatures from 707 deg. F. to 900 deg. F. To accommodate the variety of fuels available, these units are designed for stoker, pulverized coal and blast furnace gas firing.

FOSTER WHEELER CORPORATION, 165 BROADWAY, NEW YORK 6, N. Y.



Capacity 66,000 lb. steam per hour, pressure 315 psi and final steam temperature 707 deg. F. Fuel: coal on stokers or blast furnace gas.

WHEELER

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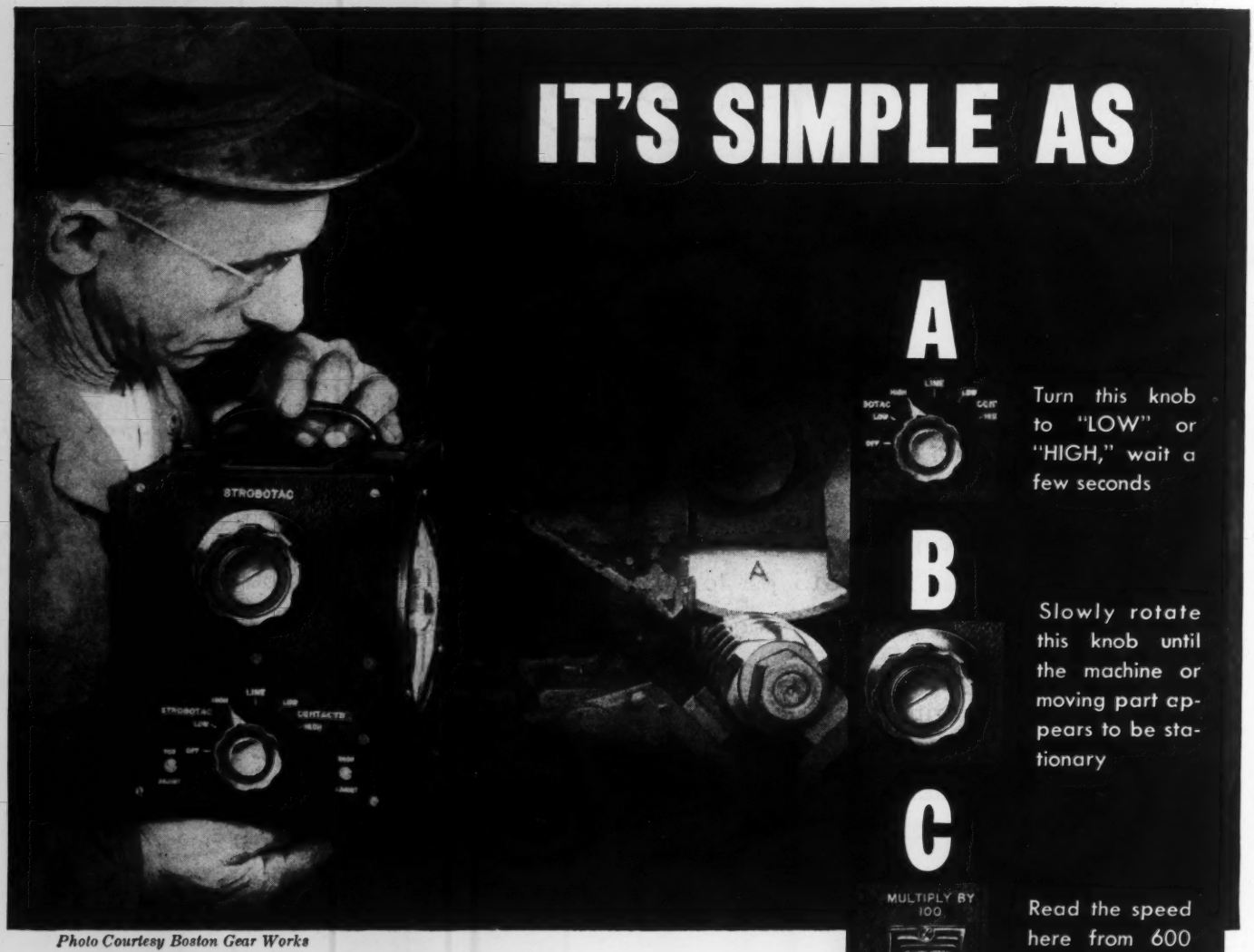

Photo Courtesy Boston Gear Works

To *MEASURE SPEED* and *STUDY MOTION*

● WITH THE STROBOTAC you can see any part of a machine in s-l-o-w motion . . . as slow as a fraction of an rpm if desired . . . while the machine is running at its normal speed! No mechanical connection between the equipment under observation and the STROBOTAC is required.

You can 'stop' motion in machinery and measure its exact speed to an accuracy of one per cent; then you can make it go through its paces running either forward or backward so that you can see any misadjustments, worn parts, slippage or other mechanical troubles.

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STROBOTACS are being manufactured only for the war effort at present. If yours is an urgent war need, you can obtain the necessary allocation from the W.P.B. After the war, STROBOTACS and other G-R stroboscopic equipment will again be available generally to help keep the wheels of Industry turning.

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Oil Hydraulic

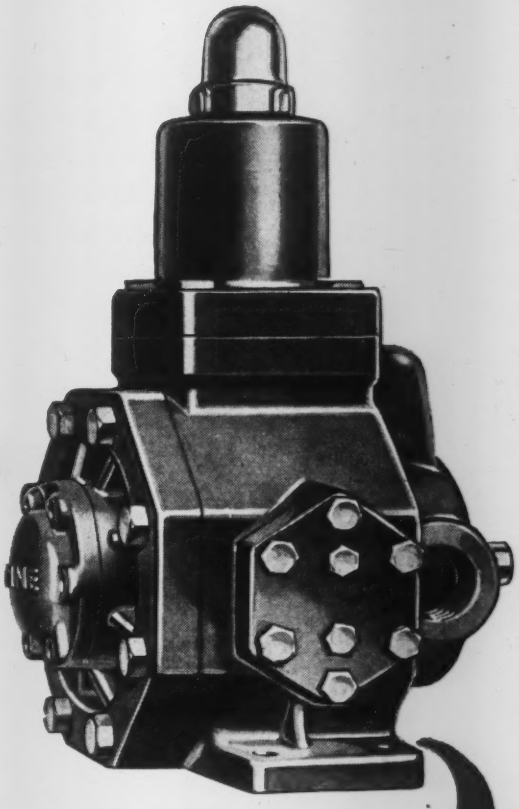
PUMPS and PRESSURE BOOSTERS

The Variable Volume principle incorporated in the design of Racine Pumps reduces horsepower requirements and provides a great flexibility of operation. These pumping units are of the multiple radial vane type, producing a smooth, quiet delivery at all operating pressures.

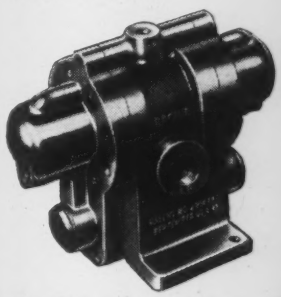
Volume ranges from zero to the full capacity of the pump. Changes are accomplished by regulating the relative position of the pressure chamber ring to the rotor. These changes are available under automatic, manual or hydraulic control. High efficiency is inherent in the simple design of Racine Pumps and is safeguarded by skilled workmanship and the maintenance of exacting tolerances on all parts.

Racine Hydraulic Pumps, Valves, Controls and Pressure Boosters have been used for many years in a wide variety of applications. Manufacturers of machine tools, presses, molding machines, lifts, stokers and a large group of other products, have standardized on Racine equipment.

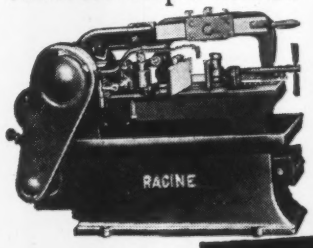
Consult our Engineering Department. Out of their long and varied experience valuable information is available to you without cost or obligation. Write today for a copy of Catalog P-10-C which illustrates the full Racine Line. Address Dept. **ME-P.**



Racine Variable Volume Pumps — Capacities 12-20-30 G.P.M. Operating Pressures 50 to 1000 lbs. P.S.I. Furnished for either clockwise or counter-clock rotation.



Racine Pressure Booster — Compact, self-contained, requires no special foundation. Available in several ratios. Converts low pressure oil to high pressure in ratios as high as 7 to 1. A simple, hydraulically actuated pumping device adaptable to any circuit. Equally effective with constant and variable volume pumps. 10⅛" high, 8⅛" wide, 18" long.



RACINE HYDRAULIC METAL CUTTING MACHINES

For almost 40 years Racine has built constantly improved high speed Metal Cutting Machines. All capacities from 6" x 6" to 20" x 20" are available. See these machines as illustrated in catalog No. 12. Select the model best adapted to your production, maintenance or tool room job.

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RACINE TOOL and MACHINE COMPANY
Standard for Quality and Precision
RACINE, WISCONSIN, U. S. A.

2¾% Nickel Steel locomotive rods, one bent cold to show ductility.

QUENCHED AND TEMPERED NICKEL STEEL FORGINGS COMBINE EXCEPTIONAL DUCTILITY WITH HIGH TENSILE STRENGTH

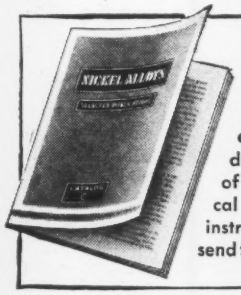
Composition and Typical Properties of Normalized Quenched and Tempered 2¾% Nickel Steel Rods

Description or Size	Melt Yield Pt. No. #s per Sq. In.	Tensile Strength #s per Sq. In.	Elong. % in 2 In.	Reduction in Area %	ANALYSIS					
					Car.	Mang.	Phos.	Sul.	Sil.	Ni
Main Rod....	92900	110000	25.0	64.4	.31	.78	.027	.026	.25	2.75
Main Rod....	86500	104500	25.5	65.6	.32	.86	.034	.032	.29	2.69
Main Rod....	86360	104400	26.0	64.8	.32	.86	.034	.032	.29	2.69
Main Rod....	87850	102350	26.0	66.2	.31	.89	.037	.025	.32	2.69
Front Rod....	86000	102250	25.0	67.3	.29	.82	.035	.027	.24	2.71
Front Rod....	83900	104250	25.0	66.1	.29	.82	.035	.027	.24	2.71
Front Rod....	86850	104250	27.0	66.1	.32	.86	.035	.025	.30	2.65
Front Rod....	89500	107050	25.5	65.6	.32	.86	.035	.025	.30	2.65
Back Rod....	89500	107650	25.0	62.7	.30	.79	.030	.025	.22	2.71
Back Rod....	87500	106450	25.0	65.4	.29	.82	.035	.027	.24	2.71
Back Rod....	87000	105600	25.0	65.4	.29	.82	.035	.027	.24	2.71
Back Rod....	88150	104850	26.0	66.8	.29	.82	.035	.027	.24	2.71

Specimens Taken from Mid-Section of Prolongations of the Forgings

The above table compiled by the American Locomotive Company shows the chemical compositions and mechanical properties of some normalized, quenched and tempered nickel steel front, main and back rods recently produced as replacement rods for locomotives being speeded up and rebalanced. These values are typical of replacement rod forgings recently tested by that company.

Quenched and tempered nickel steel forgings provide high tensile strength and ductility, combined with unusual toughness and high fatigue strength—qualities which tend to obviate breakage and assure long, trouble-free service when employed in heavy duty machinery and equipment.



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Where there is machinery in motion, there is vibration, and vibration means strain to machine and to man. Lord Shear Type Mountings and other bonded rubber products control and isolate vibration.

Factories that are quieter, pleasanter, more efficient; automobiles, trucks, buses, locomotives, airplanes that are smoother and safer in operation; delicate laboratory equipment that is made more accurate and trust-worthy; these are the results that Lord is helping designers and manufacturers to accomplish.

The science of vibration control and isolation has been developed by Lord for more than twenty years. This accumulated experience is available to you, without cost, whenever you are faced with a vibration problem.

Write for free literature which will bring you up to date in factual information on vibration control. Lord Vibration Engineers will work with you to bring your product to a new standard of perfection.

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THE GARLOCK KLOZURE Oil Seal (Patented) resists oil and water at high or low temperatures. Stays firm; stands up under severe conditions without losing its toughness, density or resiliency.

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The Standards COLUMN

News of Interest to Manufacturers

Multiple Activity Process Chart

UP to the present there has been no uniform practice in charting the activities of either the man or the machine. This applies to the number of classes into which activities are divided and also to the method of representing those classes by graphical means. The practice of some has been to divide all activities of both men and machines into two classes: "working" (running) and "idle." Under this classification a machine is "working" when it is performing the work for which it is intended and is "idle" at all other times.

The practice of others is to divide man's activities into two classes, "working" and "idle" and a machine's activities into three classes, "running," "being attended" and "idle." "Being attended" includes such activities as tool setting or preparing the machine for work and the loading and unloading of the machine with the material or parts being worked upon. "Idle" is when the machine is neither running nor being attended.

Still others recognize four conditions or classifications which may be stated as follows: (1) "Man working" occurs when a person performs an operation or any part of an operation independently of a machine or of another person; (2) "Machine running" is defined as the time the machine operates, performing its work, without requiring attention, so that the operator is free for other work; (3) "Combined activity" occurs during the part of a work cycle in which the man is working with a machine or with another man; and (4) "Idleness" is complete inactivity on the part of a man or machine.

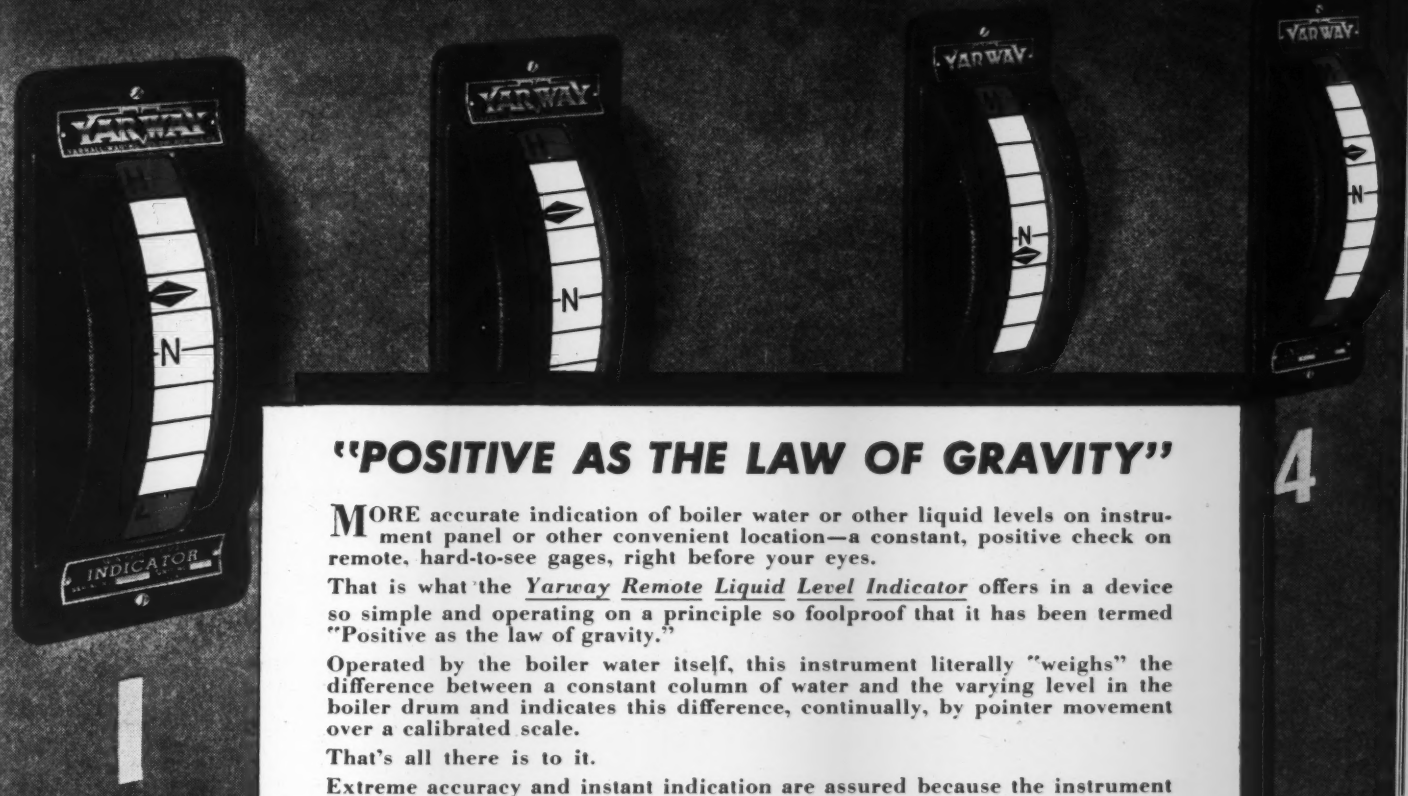
Activities have usually been represented by lines or bars drawn against a time scale, using a different color or sectioning of the bar for each separate activity. When only two classes of activities are charted black or cross sectioning and white have been most frequently used to represent them, but there has been no uniformity in practice as to which represents "working" or "running" and which represents "idle." Sometimes red has been used for "idle," in which case either white or black or cross sectioning has been used for working or running. When three classes of activities are charted the only uniformity has been that when red is used it represents "idle." However, when no color is used, the three activities, "working," "being attended," and "idle" are represented by white, cross sectioning, and black, but there has been no uniformity in practice as to which bar represents a given activity.

The proposed Multiple Activity Process Chart consists of seven separate over-lapping charts, each depicting the activities of a man or machine under investigation. With the exception of chart No. 1, the only visible section of each successive chart is a $^{5}/_{16}$ in. margin at the right. At the left-hand edge of this margin is a column $^{3}/_{32}$ in. wide which is filled in with colors or is cross sectioned to represent the different activities of the operator or machine that is being charted. By this arrangement the bars are brought close together for easy study and reference. By turning over each page just as the pages of a book are turned from right to left, the complete descriptions of the activities are revealed.

For further information—address

The American Society of Mechanical Engineers
29 West 39th St., New York 18, N. Y.

NEWS! A Water Level Indicator Operated by the Boiler Water Itself



"POSITIVE AS THE LAW OF GRAVITY"

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That is what the *Yarway Remote Liquid Level Indicator* offers in a device so simple and operating on a principle so foolproof that it has been termed "Positive as the law of gravity."

Operated by the boiler water itself, this instrument literally "weighs" the difference between a constant column of water and the varying level in the boiler drum and indicates this difference, continually, by pointer movement over a calibrated scale.

That's all there is to it.

Extreme accuracy and instant indication are assured because the instrument is frictionless. There are no stuffing boxes. Operates by means of a unique, powerful, permanent magnet transmission between actuating mechanism, under pressure, and indicating mechanism, at atmosphere.

Hundreds of Yarway Remote Liquid Level Indicators in service throughout Industry and the Yarway Steam Laboratory's own accelerated endurance test (duplicating over 50 years of normal boiler service) have proved the dependability of this instrument beyond question.

Satisfied that it more than meets exacting Yarway Standards, this instrument is now offerod to the general public. Look into this *moderately priced* instrument which is easily installed on new or existing boilers and is suitable for all pressures up to 1500 lbs.

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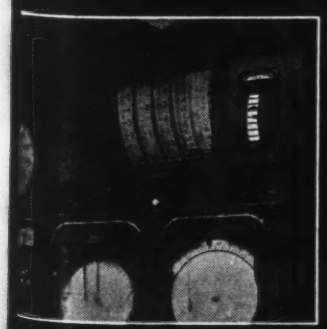
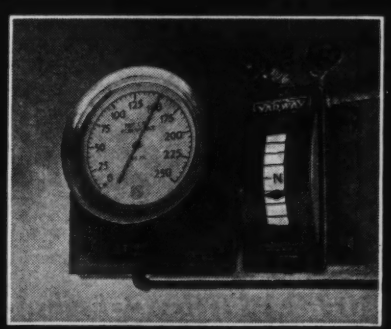
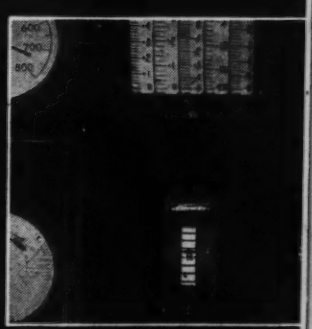
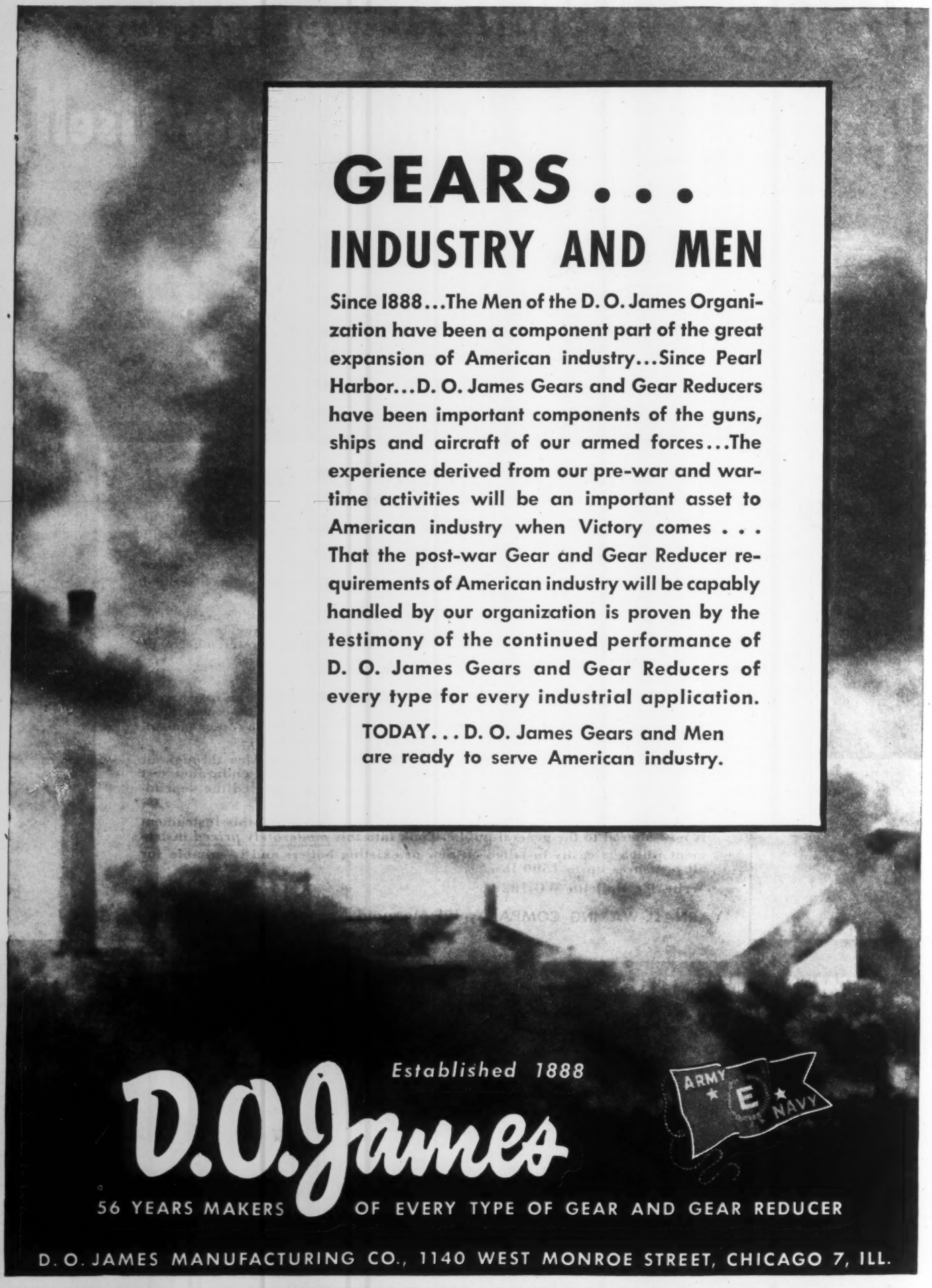






YARWAY REMOTE LIQUID LEVEL INDICATOR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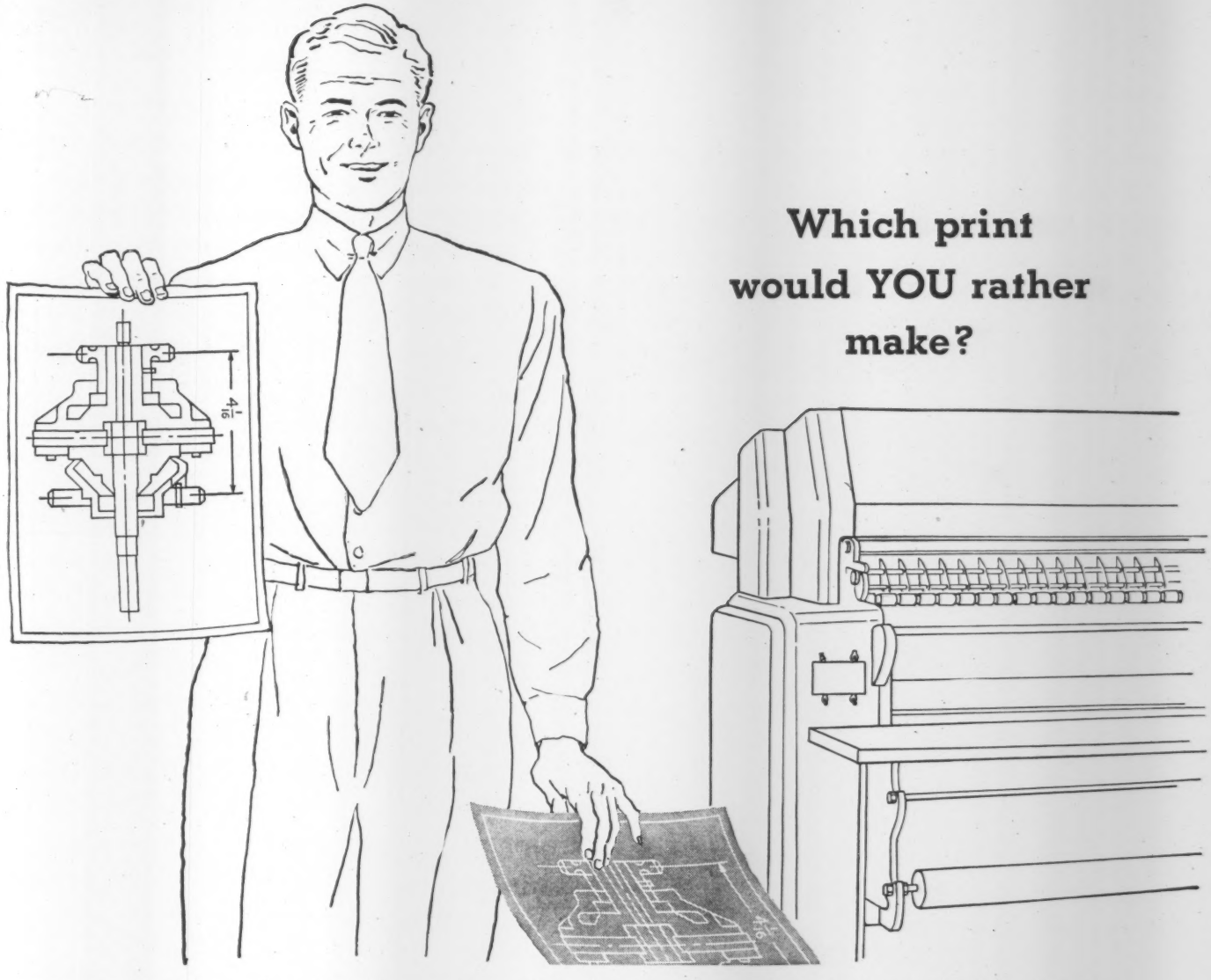

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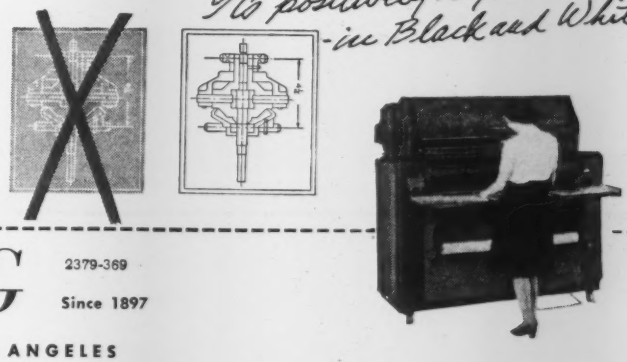

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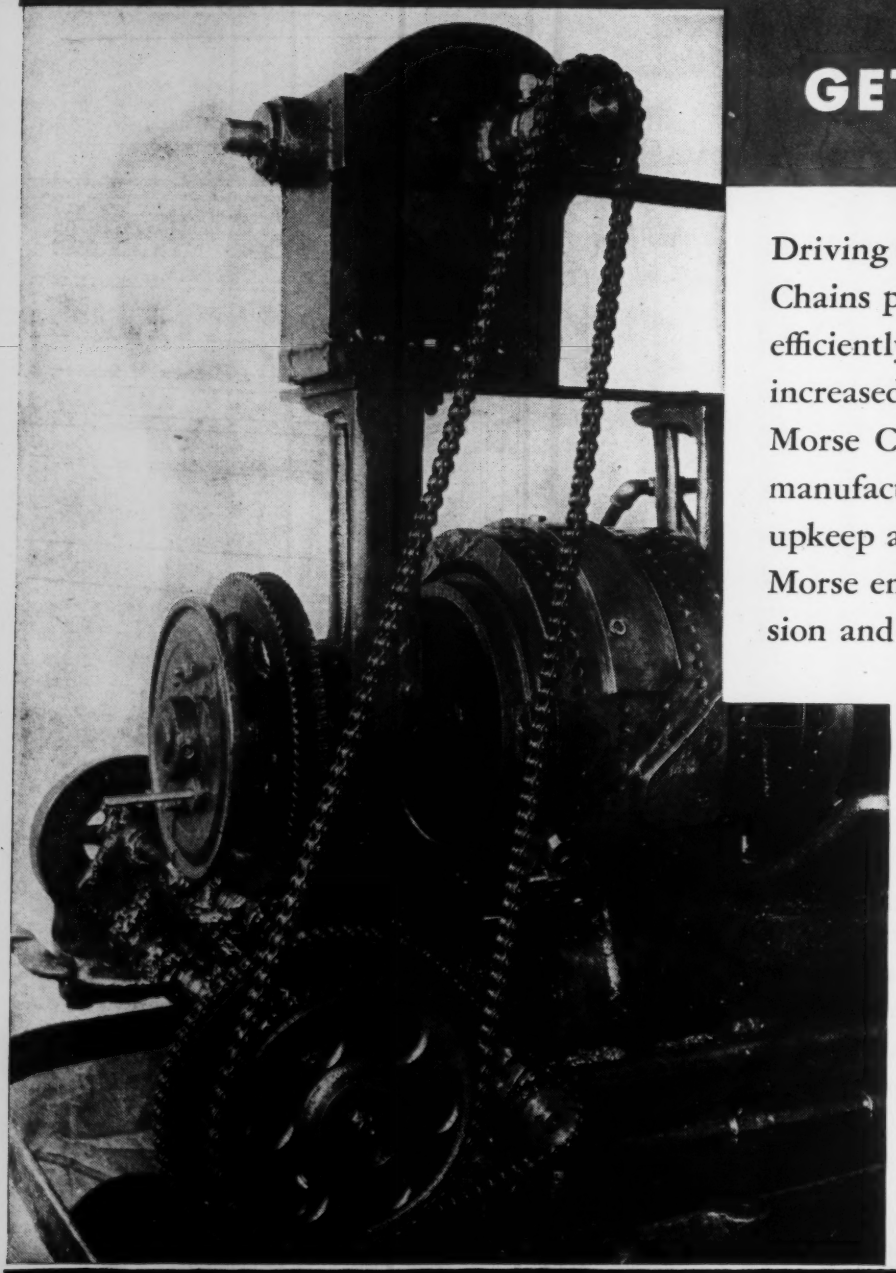
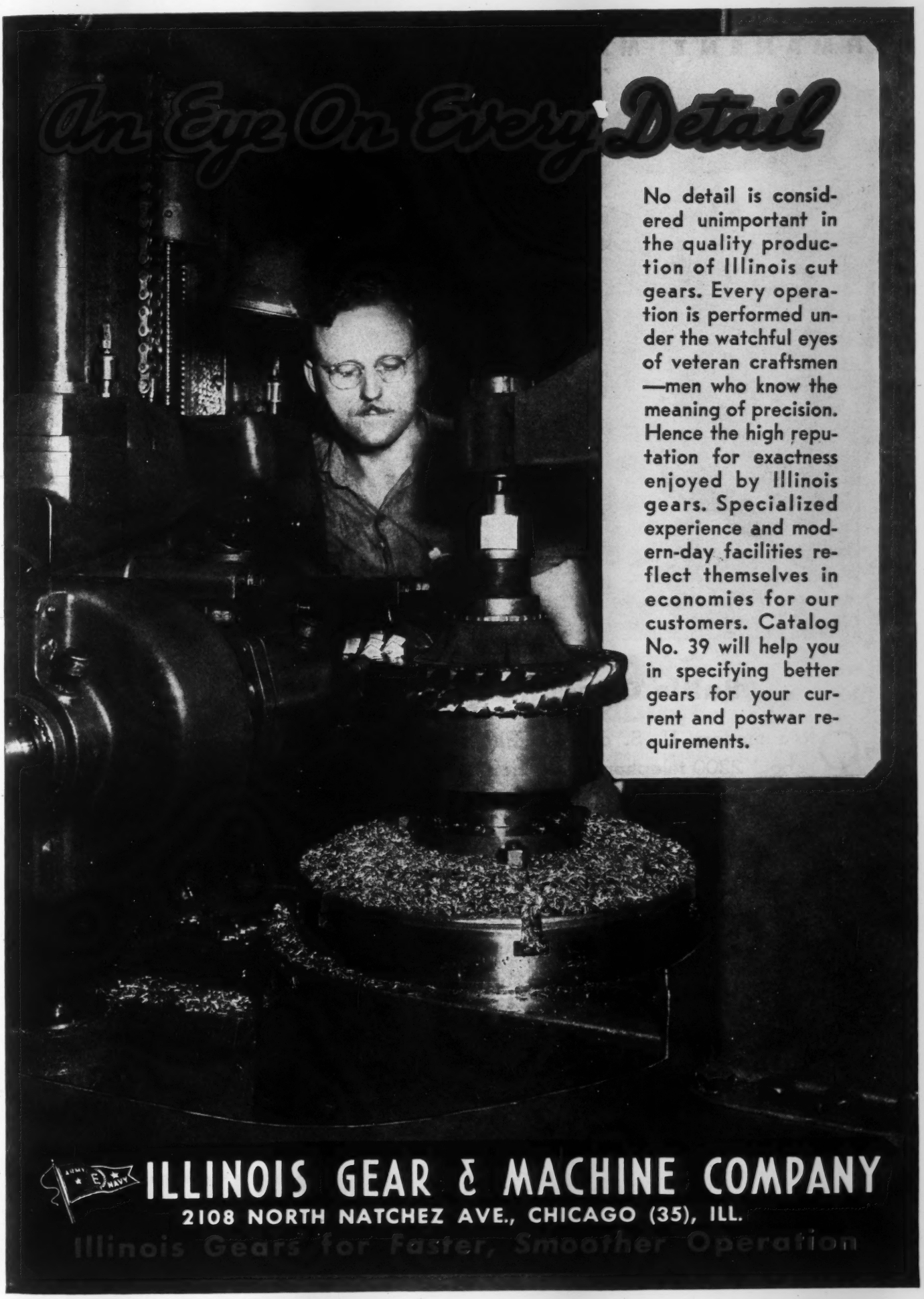


Driving through teeth, not tension, Morse Chains prevent slippage, transmit power efficiently and economically. "Production increased 25% with the installation of Morse Chains"—says one machine parts manufacturer. Save substantially in time, upkeep and replacement costs—consult a Morse engineer on *your* power transmission and control problems.

SPROCKETS CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE Roller and Silent CHAINS

MORSE CHAIN COMPANY • ITHACA, N.Y. • DETROIT 8, MICH. • A BORG-WARNER INDUSTRY


An Eye On Every Detail
No detail is considered unimportant in the quality production of Illinois cut gears. Every operation is performed under the watchful eyes of veteran craftsmen —men who know the meaning of precision. Hence the high reputation for exactness enjoyed by Illinois gears. Specialized experience and modern-day facilities reflect themselves in economies for our customers. Catalog No. 39 will help you in specifying better gears for your current and postwar requirements.
ARMY E NAVY
ILLINOIS GEAR & MACHINE COMPANY
2108 NORTH NATCHEZ AVE., CHICAGO (35), ILL.
Illinois Gears for Faster, Smoother Operation

PERMANENT MAGNETS MAY DO IT BETTER

OFFICIAL U. S. NAVY PHOTOGRAPH

Battle Commands Reach All Hands!

ON a modern U. S. dreadnaught, about 2200 telephones and more than 300 loudspeakers link all battle stations. They flash orders and reports instantly—make possible the split-second timing that wins battles.

Vital parts of each telephone and speaker are permanent magnets. They are also employed in radio and sub-detection equipment, firing systems, compasses, instruments and numerous other devices, raising the total per battleship high into the thousands.

Because we manufacture permanent magnets for virtually every use known to science, our specialized knowledge of design and production is unusually complete. If you have a problem involving permanent magnets, our engineers will be pleased to consult with you. Write for a copy of our "Permanent Magnet Manual".

ARMY E NAVY

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The
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★ SPECIALISTS IN PERMANENT MAGNETS SINCE 1910 ★

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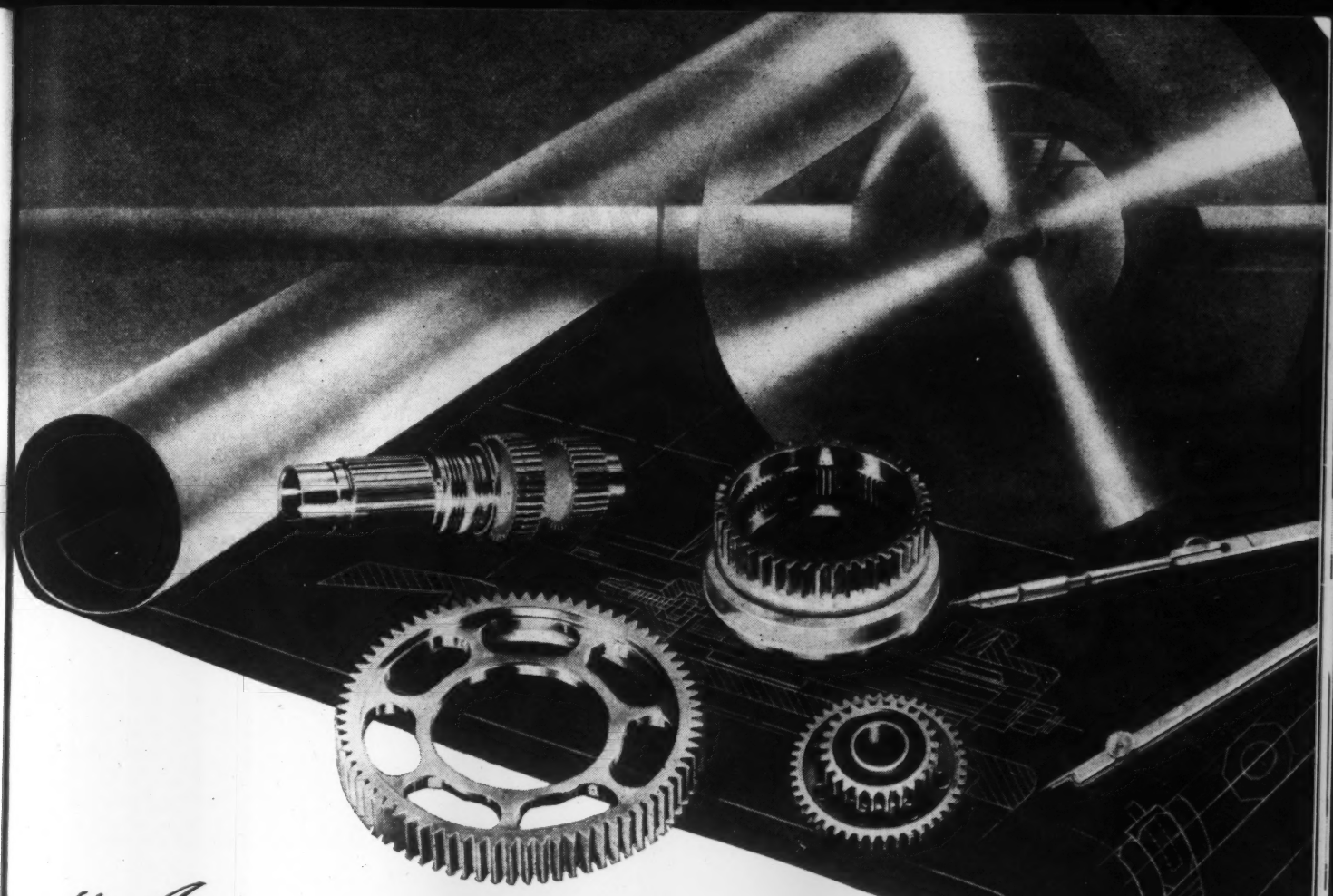


"Aircraft Quality" GEARS

OFFER ADVANTAGES FOR YOUR PRODUCT

War urgency demands the seemingly impossible of men and machines. Before the war the "aircraft quality" gears that Foote Bros. are today producing were hardly more than an engineer's ideal.

Today these gears, closely approaching theoretical perfection, are flowing off Foote Bros.' production line by the hundreds of thousands.

"Aircraft quality" gears were developed to meet the exacting demands of the powerful Pratt & Whitney engines. Light weight and tremendous strength—the ability to stand high speeds and heavy loads, and yet assure long life were essential. Despite extremely thin sections, "aircraft quality" gears must carry tooth loads far in excess of values customarily considered safe design and must operate at pitch line velocities that can be measured in miles per minute.

These unique qualities of Foote Bros. "aircraft quality" gears offer many advantages to manufacturers of equipment requiring the transmission of power. Right now in the drafting room and experimental laboratories of many of these manufacturers—designs for tomorrow's peacetime machines are being developed—new machines whose performance will be improved by the Foote Bros. gears incorporated in their design.

"Aircraft quality" gears may solve problems for your engineers—they will assure higher speed, longer life, lighter weight, more compact design—they may even make possible new developments that otherwise would be impractical.

To aid your engineers in determining the advantages which "aircraft quality" gears will bring to your product, our engineering department is now developing an engineering manual which should be in the hands of every designing engineer—every production man—facing problems of power transmission. A copy will be sent on request as soon as it is ready.

* * *

FOOTE BROS. GEAR AND MACHINE CORPORATION
Dept. Q, 5225 S. Western Blvd. • Chicago 9, Illinois

This informative product engineering manual on "aircraft quality" gears contains data on a new and revolutionary type of precision gear. A copy will be sent to you on request as soon as it is ready.

FOOTE BROS.

Better Power Transmission Through Better Gears

FOOTE BROS. GEAR AND MACHINE CORPORATION
5225 S. Western Blvd., Chicago 9, Ill. Dept. Q

Please send me a copy of the Engineering Bulletin on "Aircraft Quality" Gears as soon as it is available.

Name.....

Position.....

Company.....

Address.....

City.....*State*.....

Put your Factory Heating on a Postwar Competitive Basis

STOP WASTE with CLARAGE UNIT HEATERS!

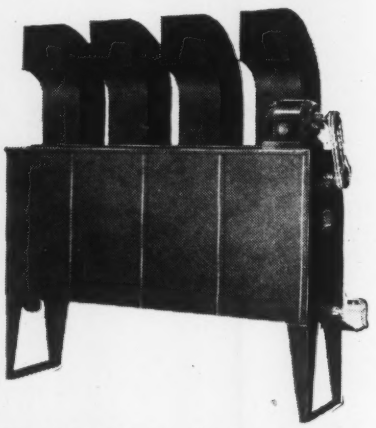
LOWER OPERATING COSTS!— that's what most companies must have to meet tough postwar competition.

What did it cost to heat your plant last winter? How was it heated? Possibly there's an opportunity to save a nice fat sum right here on this one item: *factory heating!*

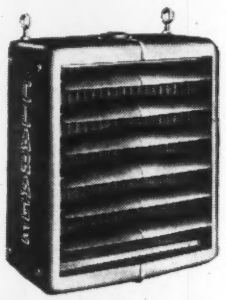
There *certainly is,* if you're still using wasteful coils or cast iron radiation, or if you've been getting along with obsolete or worn out unit heaters which lack the high efficiency and fuel-saving features of Clarage Units.

Another winter coming up! Clarage Unit Heaters installed now can start paying for themselves immediately — not only by stopping fuel wastage, but by helping your plant maintain top-level production so dependent upon uniform, comfortable temperatures.

Clarage Unit Heaters are built in sizes to meet all types of jobs, operating on steam or hot water — prompt deliveries where necessary. Call in our application engineers for a consultation — write, wire or phone us today.



UNITHERM TYPE — for large space, wide area applications. Syncrotherm Control (a patented feature) insures adequate heating with LOWER temperature air—important fuel savings! Square outlets removable and adjustable for 4 directions of heat flow. V-belt drive for quieter operation. All parts easily accessible. Furnished as either floor or suspended type units.



CLARCO TYPE — for small space heating, and for places where more heat is needed than present equipment can supply. Also suitable for heating offices, stores, assembly rooms, etc. Very quiet in operation. Easily installed along side walls or at ceiling line.

Clarage equipment can be purchased on a priority rating AA-5 or better, or on repair order MRO.

COMPLETE AIR CONDITIONING
•
COOLING
•
VENTILATION
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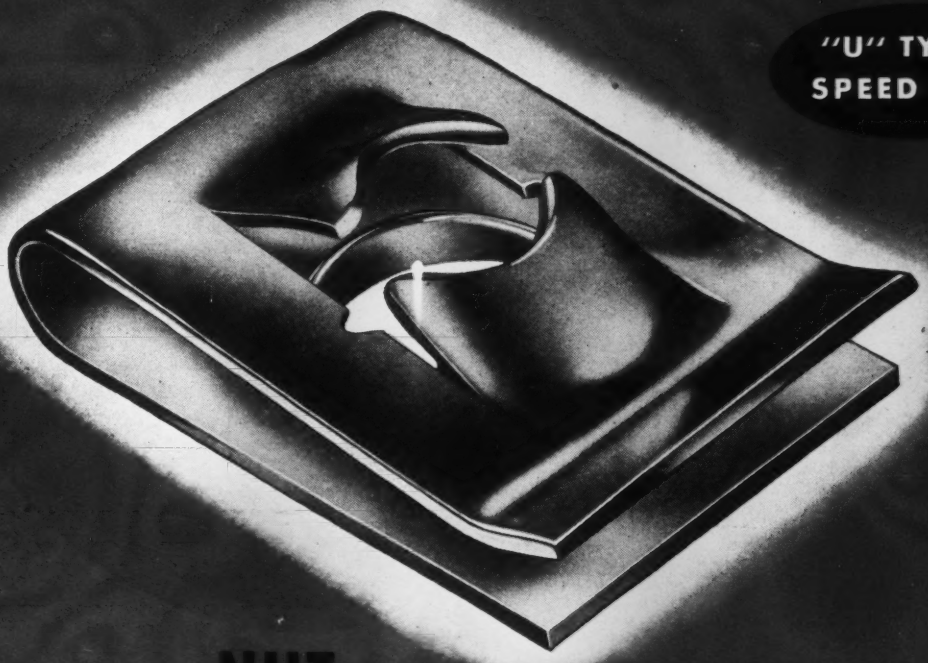
FACTORY HEATING
•
MECHANICAL DRAFT
•
FANS and BLOWERS for INDUSTRIAL NEEDS

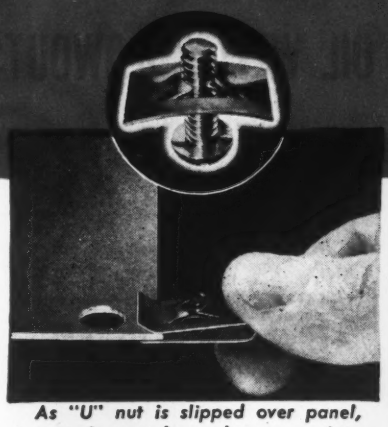
Clarage Fan Company Kalamazoo 16, Mich.

APPLICATION ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

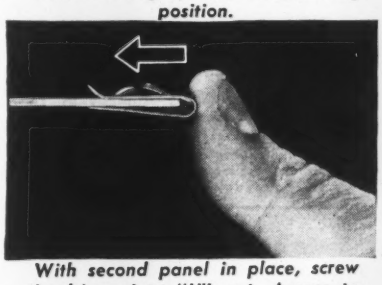
ONE OF A SERIES PORTRAYING THE "SPEED NUT FAMILY OF FASTENERS"



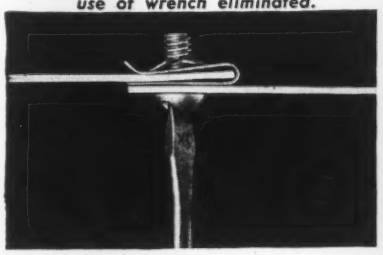
HERE'S THE NUT THAT *Holds itself* IN PLACE!



As "U" nut is slipped over panel, extrusion on lower leg snaps into hole—locking nut in screw-receiving position.



With second panel in place, screw is driven into "U" nut. Access to opposite side is unnecessary and use of wrench eliminated.



Here is a spring steel lock nut that broadens the smile of engineers and assemblymen everywhere. No more fussin' or cussin' over blind location fastening problems. No more expensive welding, riveting, or clinching nut plates in location. For "U" type SPEED NUTS merely snap into holes along the edge of panels, brackets, or flanges.

An extrusion formed in the lower leg of the "U" nut snaps into the screw hole and retains the nut in perfect register until final assembly. By varying the size of the hole, any degree of "float" may be obtained, to compensate for misalignment.

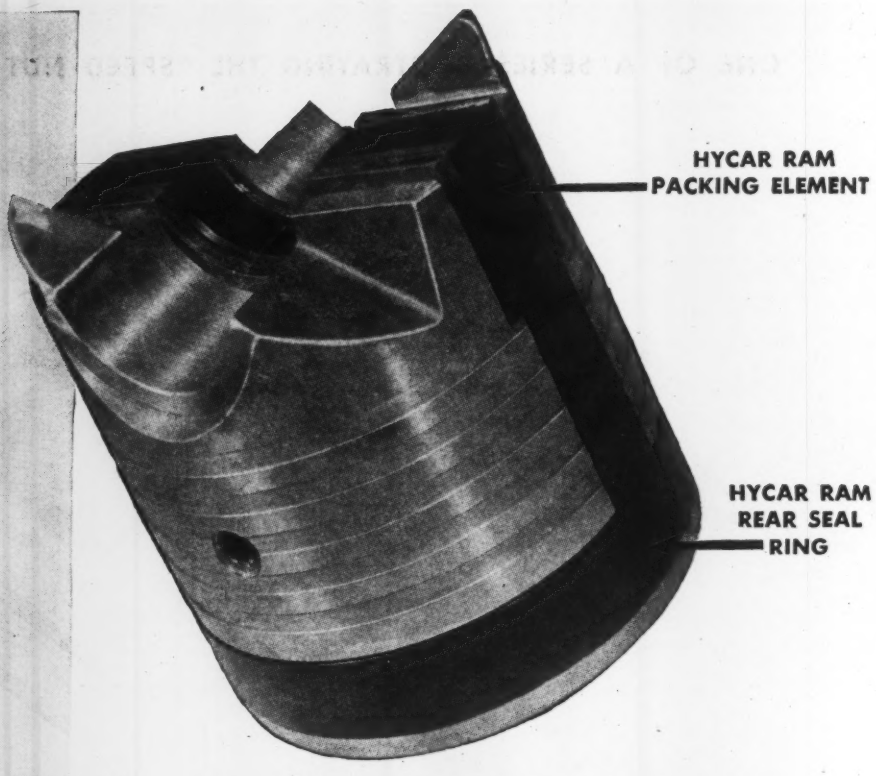
In addition to simple and speedy application, "U" type SPEED NUTS possess exceptional holding power and their arched prongs absorb vibration to definitely prevent loosening. Millions of "U" nuts were used on metal, wood, and plastic products before the war—millions more are being used today on war equipment. And postwar products that will capture the biggest markets will be assembled faster and at lower costs with SPEED NUTS. The men with the assembly "know-how" are the ones who move up the fastest. Write today for literature.

TINNERMAN PRODUCTS, INC.
2124 FULTON ROAD, CLEVELAND 13, OHIO

*Speed Nuts** PATENTED

*Trademark Reg. U. S. Patent Office

FASTEST THING IN FASTENINGS



HYCAR RESILIENT PACKINGS PREVENT COSTLY OIL WELL "BLOWOUTS"

Properties which make this possible have many applications in all industry

WHEN an oil well like the one in the picture "blows out", chances are that expensive tools and machinery will be ruined, oil will be wasted, the well will be useless, lives may be lost. That's why, a few years ago, a "blow-out preventer" was developed. It fits around the drill pipe at the top of the well, ready to go into action if the drill hits a high pressure zone deep down in the ground. When that happens the preventer closes around the pipe and makes a tight seal against pressures as high as 5000 p.s.i. The seal then has to be maintained—even when the pipe is being rotated while adjustments are being made—for 6 to 9 hours.

Hycar synthetic rubber was selected for the resilient sealing element—and for good reasons. Hycar is able to provide the *right combination* of properties needed for this job—oil and gas resistance, abrasion resistance, ability to stay resilient. These and other properties of Hycar synthetic rubbers are listed in the box at the right. They tell why men throughout industry are learning that Hycar is the right material for pump and valve packings, grommets, diaphragms, vibration dampeners, hose and scores of other industrial applications. *Hycar Chemical Co., Akron 8, Ohio.*

Check These Superior Features of Hycar

1. EXTREME OIL RESISTANCE—insuring dimensional stability of parts.
2. HIGH TEMPERATURE RESISTANCE—up to 250° F. dry heat; up to 300° F. hot oil.
3. ABRASION RESISTANCE—50% greater than natural rubber.
4. MINIMUM COLD FLOW—even at elevated temperatures.
5. LOW TEMPERATURE FLEXIBILITY—down to —65° F.
6. LIGHT WEIGHT—15% to 25% lighter than many other synthetic rubbers.
7. AGE RESISTANCE — extremely resistant to checking or cracking from oxidation.
8. HARDNESS RANGE—compounds can be varied from extremely soft to bone hard.
9. NON-ADHERENT TO METAL—compounds will not adhere to metals even after prolonged contact under pressure. (Metal adhesions can be readily obtained when desired.)

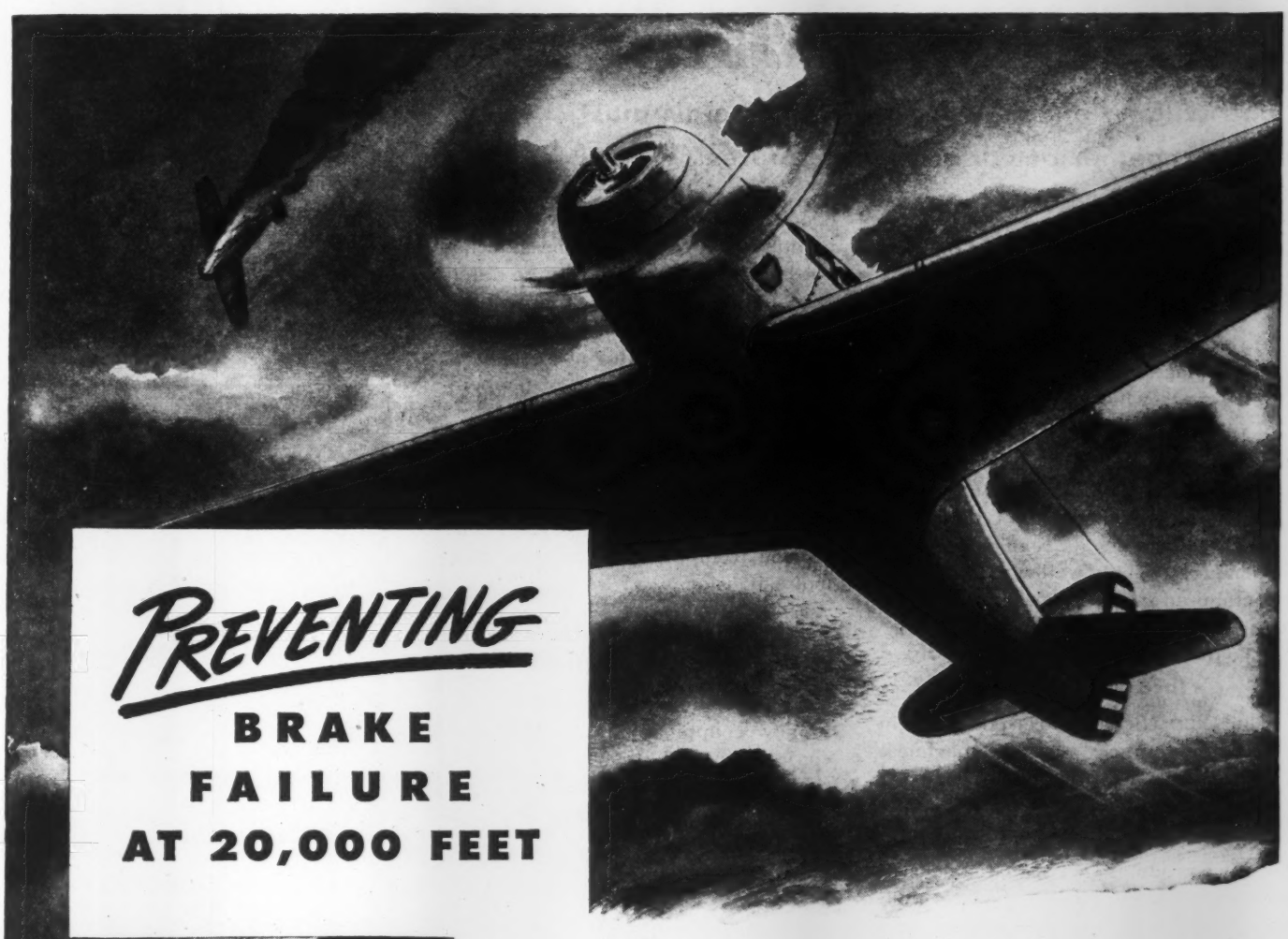
Hycar

Reg. U. S. Pat. Off.

LARGEST PRIVATE PRODUCER OF BUTADIENE TYPE

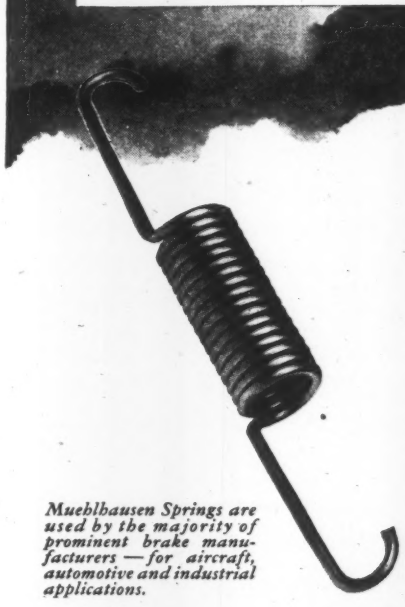
Synthetic Rubber

Free—write for your copy of the new pocket-size Hycar Glossary of commonly used synthetic rubber terminology.

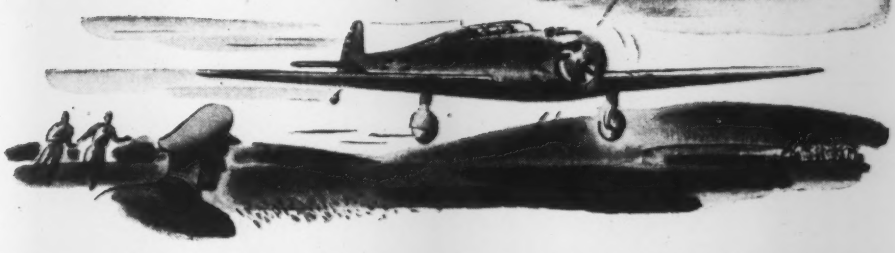


PREVENTING BRAKE FAILURE AT 20,000 FEET

-Prevents Total Failure Here!



Muehlhausen Springs are used by the majority of prominent brake manufacturers — for aircraft, automotive and industrial applications.



★ Offhand, you wouldn't think that a fighting plane could have brake failure at 20,000 feet. But, if brake control springs are improperly designed, brakes can lock during certain maneuvers at high altitudes—with disastrous results on landing.

Violent changes in temperature and sudden variations in atmospheric pressure have an effect on aircraft working parts, and must be considered by the spring designer. For, in a few minutes' time, these parts can be subjected to extreme variations—from tropical heat of 120° to the paralyzing cold of 70° below—from pressure at sea level to the rarefied atmospheres of ceiling heights.

In designing springs for aircraft applications, Muehlhausen research has successfully solved these problems. And for this reason alone, one prominent plane manufacturer* now specifies ONLY Muehlhausen Springs for the brake controls on its combat planes.

Leading product designers in every industry are consulting Muehlhausen Engineers to secure springs of lasting efficiency.

MUEHLHAUSEN SPRINGS

EVERY TYPE AND SIZE

MUEHLHAUSEN SPRING CORPORATION
Division of Standard Steel Spring Company
630 Michigan Avenue, Logansport, Indiana

* *name on request*

THERMAL EXPANSION

and what it means when different metals must work together at various temperatures

Two metals, working in adjoining valve parts, obviously need similar thermal expansion properties.

Otherwise, the valve's operation and life would suffer, either from looseness and leakage when cold, or from galling and seizing when hot.

In such applications, therefore, thermal expansion is important chiefly in a *relative* sense. Whether a metal has a high or low rating doesn't matter so much as whether its coefficient corresponds reasonably well with that of the metal used in the adjacent part.

Thermal Characteristics of Inco Nickel Alloys

The INCO Nickel Alloys possess... in addition to their strength, toughness and corrosion-resistance... heat expansion properties that fit them especially for many power applications.

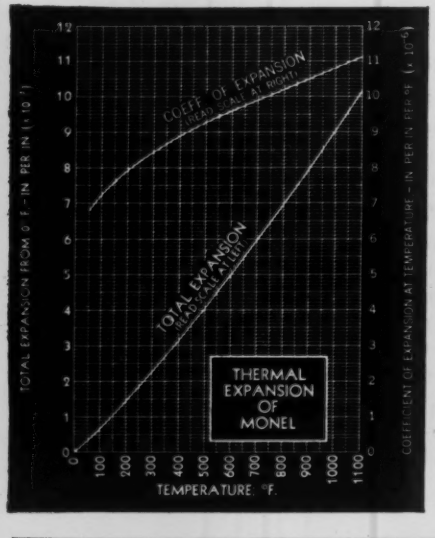
As a group, their thermal expansion about equals or slightly exceeds mild steel, and is somewhat lower than copper alloys. This in-between thermal expansion makes the high-nickel group especially suitable for parts which must maintain precision fits with *either* carbon steels or the brasses and bronzes, in valves and similar appliances.

Data on some of the alloys are shown in the accompanying charts.

What the Charts Illustrate

Each chart shows the total expansion in inches per inch when the alloy is heated from 0° F., to elevated temperatures. The net expansion in inches per inch is found by reading the difference between any two temperatures on the curve. The mean coefficient is found by dividing this net expansion by the number of degrees of temperature difference.

The upper curve of each chart, showing the instantaneous coefficient of expansion at various temperatures, provides a basis of approximate comparison from the standpoint of thermal expansion.

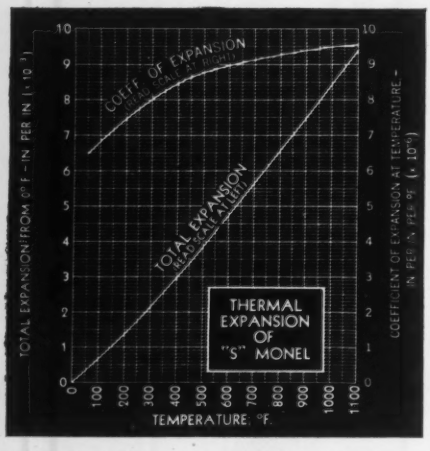


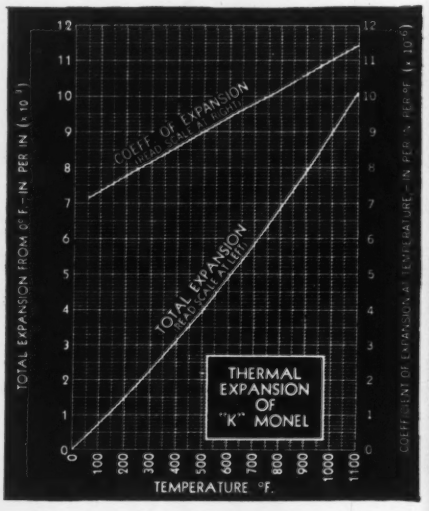
Practical Applications of Inco Nickel Alloys

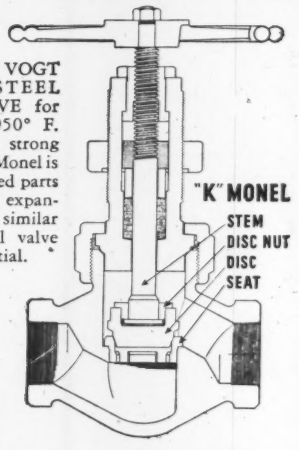
Two illustrations of high-nickel alloys in power applications are shown in conjunction with their corresponding charts.

In one instance, "K" Monel is used for the stem, disc, disc nut and seat of a forged steel globe valve, designed for 600 lb. at 950° F. service by the Henry Vogt Machine Co., Louisville, Ky. "K" Monel, in addition to being unusually strong and hard, has the necessary thermal expansion properties to assure good fit with the forged steel body under changing temperature conditions.

In the other application, cast "S" Monel is used for the disc and its cylindrical guide cage in a 12" cast steel valve, made by the Wm. Powell Co., Cincinnati, Ohio. Powell states "the 'S' Monel, heat-treated to 320-350 Brinell hardness, offers a good non-seizing, long-wearing surface for the disc, which is a free floating member, riding up and down within the cage".







DESIGN OF VOGT FORGED STEEL GLOBE VALVE for 600 lbs. at 950° F. service. Extra strong and hard "K" Monel is used in indicated parts where thermal expansion properties similar to forged steel valve body are essential.

12" CAST STEEL toggle-operated non-return valve with welding ends for 1500 lbs. W.S.P. at 900° F. Disc (in foreground) and cylindrical guide are cast "S" Monel, heat treated to 320-350 Brinell for durable non-seizing service.

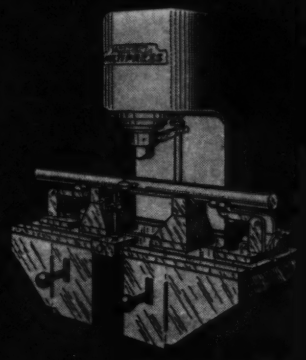
* * *

For additional information about Thermal Expansion... and about other properties important in power applications... write for "The Technical Editor Speaks". Address:

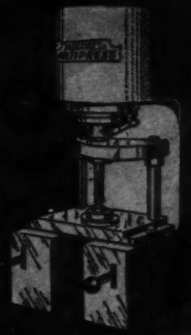
THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK 5, N. Y.

INDUSTRY'S NEW TOOL OF MULTIPLE USES

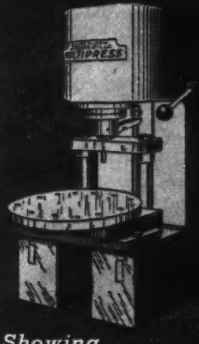
MULTIPRESS is a *new kind* of machine tool! Compact, streamlined, completely self-contained, this bench-size oil-hydraulic "work horse" packs up to 4 tons of accurately controlled power, and adapts that power to an amazingly wide range of operations. Standard fixtures and accessories extend its applications to almost every type of work calling for *pressure*—sustained or in repeat strokes . . . in single or automatically repeated cycles . . . synchronized with indexing tables or other feed mechanisms. The basic unit alone, without any of its many accessories, delivers downward ram pressures of from 300 to 8000 pounds . . . upward pressures to 5000 pounds . . . strokes of from 1/16 inch to 6 inches . . . ram speeds up to 200 inches per minute downward, or 300 upward. Work table measures 10 1/2 x 16 inches. Opening between ram and work table is 11 inches. Write today for complete details on MULTIPRESS, the NEW tool of Industry's Right Hand.



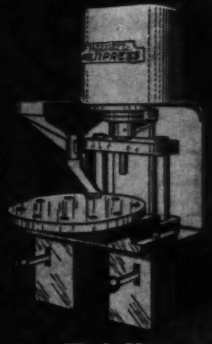
With Straightening Fixtures



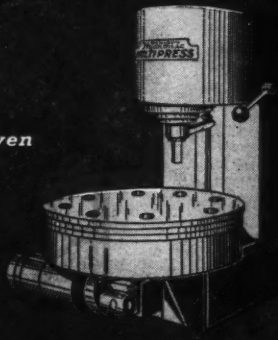
With Broaching Attachment



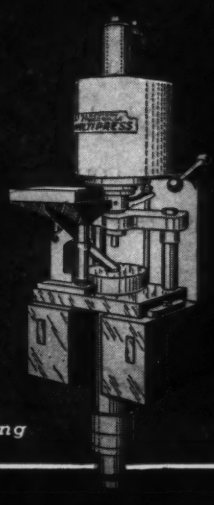
Showing Dial-Type Feed



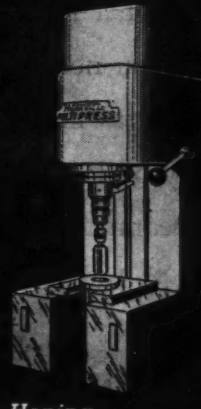
With Hopper and Dial-Type Feed



With Motor Driven Indexing Table



Equipped for Automatic Pelleting



With Honing Fixtures

Basic Unit
$575.00

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Put your hand here!

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HANDLING is believing. Get the finger tips of your left hand on the control ring of a PARAGON Drafting Machine. The lightest pressure is all you need to set the scales at the angle you want, anywhere on the drawing board. Your right hand is always free. For the full story of PARAGON features, convenience and handsome modern appearance, write on your letterhead to Keuffel & Esser Co., Hoboken, N. J.

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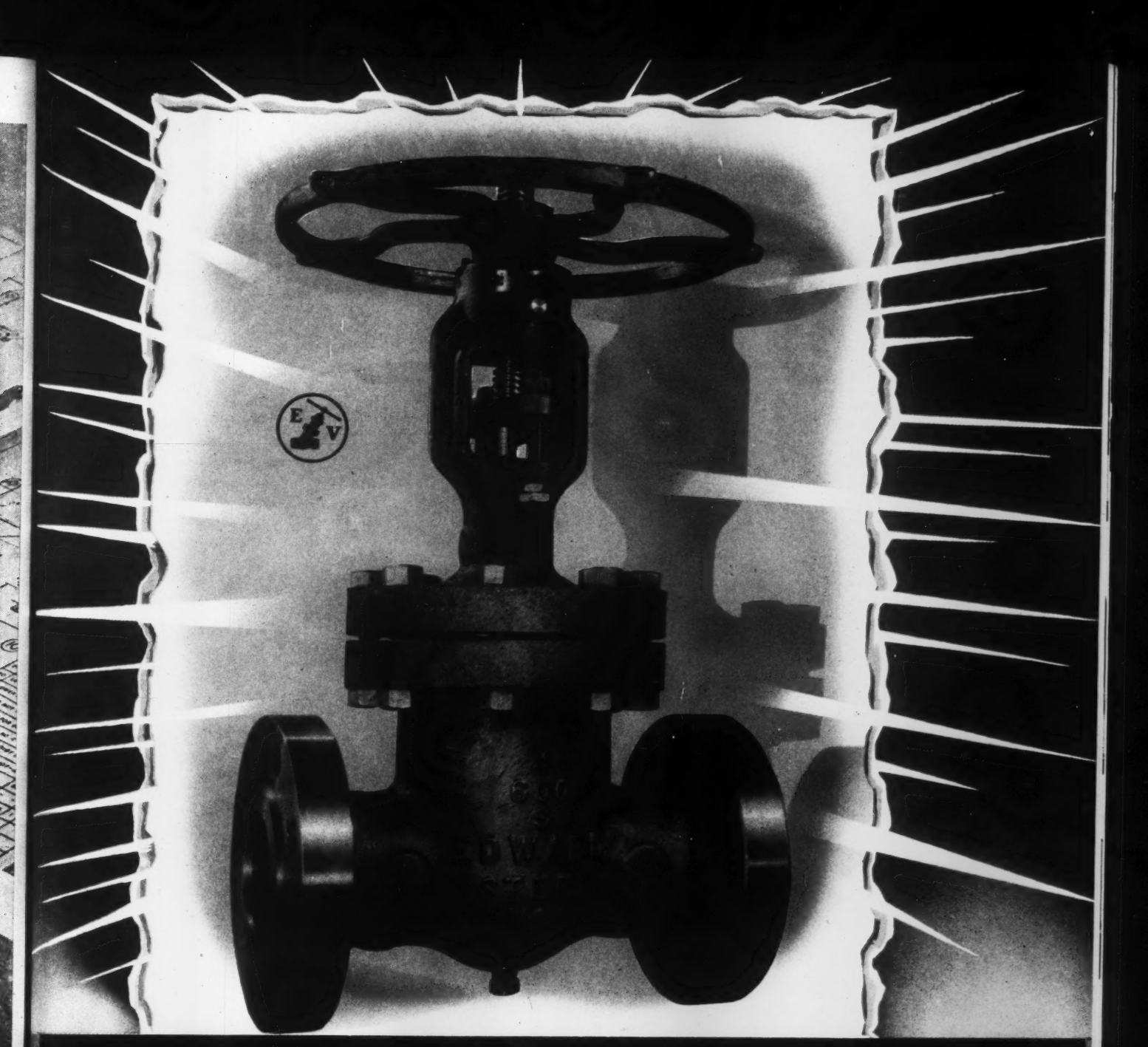


Basically different in design,
here is a **GATE VALVE** *with all*
working parts in correct alignment.

Now by **EDWARD**

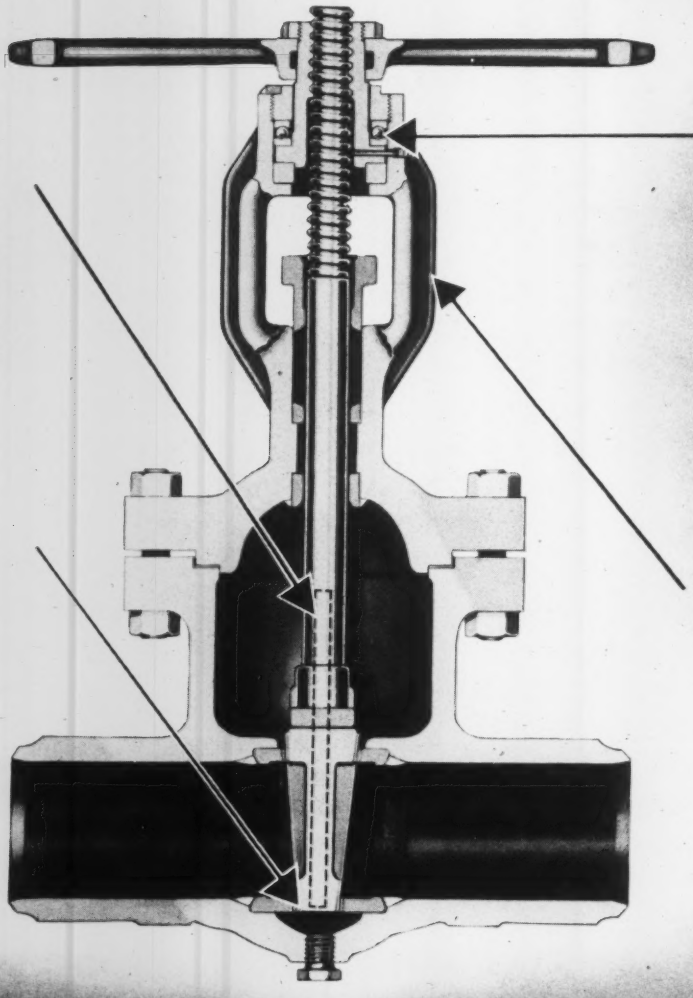
WRITE FOR CATALOG 12-E

THE EDWARD VALVE & MFG. CO., INC.
EAST CHICAGO, INDIANA

Here are four important basic differences in **EDWARD** *cast steel* GATE VALVE design

1 Close fitting hardened wedge guides welded to body *after* seat rings and wedge are located. The result—perfect alignment of working parts and elimination of unnecessary wear-producing drag of wedge across seating faces in opening and closing valve under pressure.

2 Correctly positioned hard surfaced seats, integral with body, and hard faced wedges. Standard construction—*not a "special" which must be ordered.*



3 Simple yoke construction with ball bearing operation even in medium sizes, EValized surfaces where abrasion is a problem, and no superfluous parts.

4 One piece bonnet for absolute alignment, easy operation and minimized maintenance.

No wobbly wedges to cause excessive seating wear or slam against stem head when opened under pressure in Edward gate valves. In contrast with traditional gate valve design, guide ribs in Edward gate valves are accurately located with respect to seat faces and wedge, then welded integrally to body with continuous weld fillets. Clearances are thus cut to minimum and wedge can travel practically to closed position before seating faces touch.

THE EDWARD VALVE & MFG. CO., INC.
EAST CHICAGO INDIANA

From the family album HYATT

Up to the minute Hyatt engineering help is at your service for the solution of immediate or future bearing design problems.

Half a century ago, industrial designers first began to eliminate friction in their machines and equipment. Hyatt Bearings with spirally wound rollers became the accepted standard with resulting increased machine capacity, improved performance and lengthened service life.

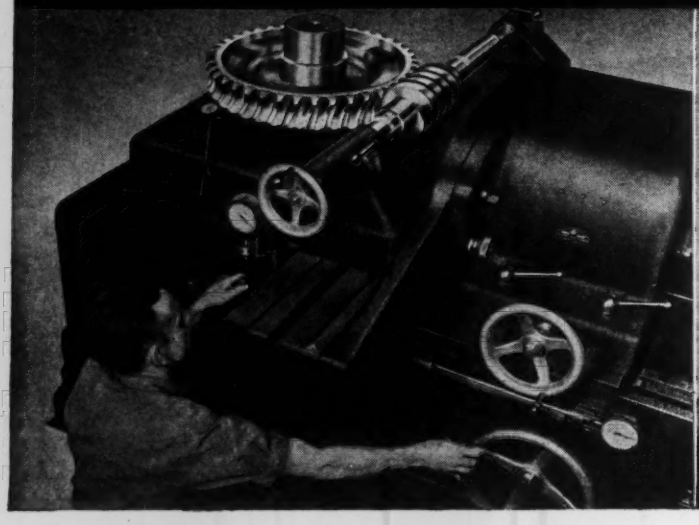
Portrait of an early Hyatt family group appears at the top—many of these types are still in use—doing a superb job.

Several newer types of Hyatt Bearings match today's modern conception of *super*-precision—all are especially designed for the job to be done. Lower group illustrated includes Hy-Load Bearings, Super-charger Bearings, Aircraft Engine Bearings, Solid Roller Junior Bearings, Industrial Inch Bearings and Dual Purpose Spherangular Bearings. Further information on any type for your specific purpose gladly furnished.

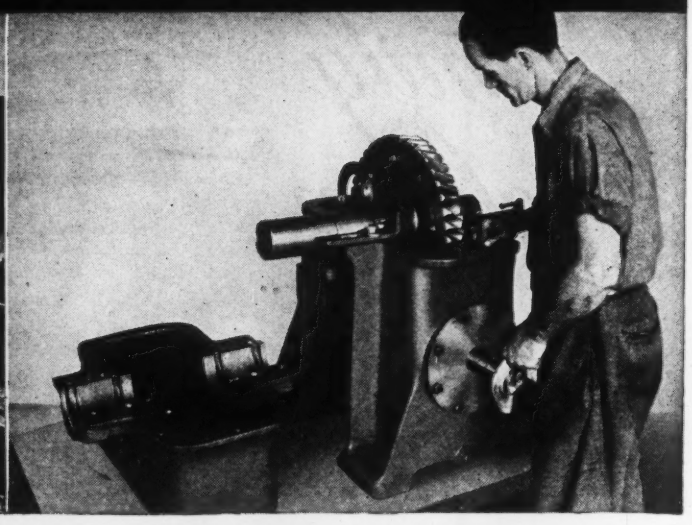
HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, N.J.

Chicago • Detroit • Pittsburgh • Oakland, California

CHECKED for TOOTH CONTACT



1.—Checking tooth contact with worm and gear located at exact center distances, checked to within 1/10,000th of an inch.



2.— Checking tooth contact by means of "bearing blue" after assembly.

BOTH BEFORE and AFTER ASSEMBLY

Before assembly, every De Laval Worm Gear is tested on the machine shown at the left, in which it is accurately mounted with the center line of the gear and the center line of the worm correctly spaced and at true right angles. Under these conditions the tooth contact is observed and the back lash accurately measured.

After assembly in the gear case, tooth contact is re-checked by means of bearing blue to assure correct adjustment. Such checking and holding center distances within close limits assures satisfactory operation of De Laval Worm Gear Speed Reducers, and facilitates installation when De Laval Worm and Gear sets are purchased for use in other machinery.

Specifications alone do not make a worm gear.

1147

TURBINES • HELICAL GEARS and WORM GEAR SPEED REDUCERS CENTRIFUGAL PUMPS • CENTRIFUGAL BLOWERS and COMPRESSORS • IMO OIL PUMPS

WORM GEAR DIVISION

DE LAVAL

STEAM TURBINE COMPANY · TRENTON 2, NEW JERSEY

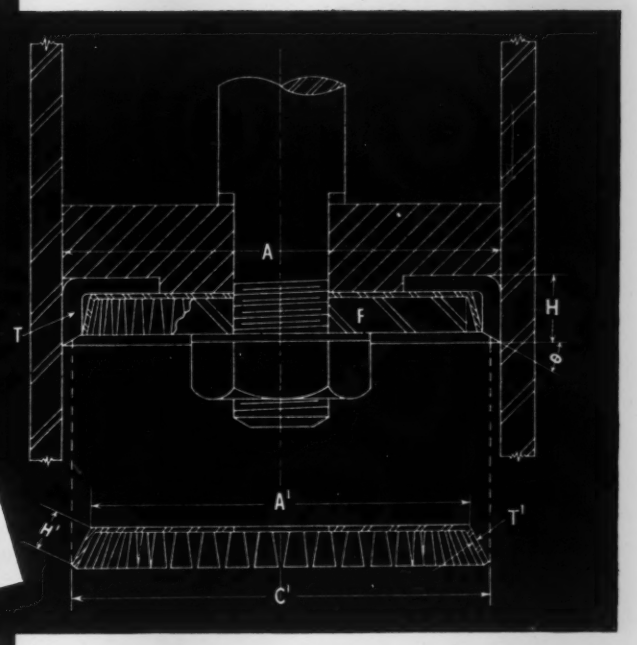
SALES OFFICES: ATLANTA • BOSTON • CHARLOTTE • CHICAGO • CLEVELAND • DENVER DETROIT • DULUTH • EDMONTON • GREAT FALLS • HAVANA • HELENA • HOUSTON KANSAS CITY • LOS ANGELES • MONTREAL NEW ORLEANS • NEW YORK • PHILADELPHIA PITTSBURGH • ROCHESTER • ST. PAUL • SALT LAKE CITY • SAN FRANCISCO • SEATTLE TORONTO • TULSA • VANCOUVER • WASHINGTON, D. C. • WINNIPEG

GRATON & KNIGHT ENGINEERS

Present

PACKINGS POINTERS

No. 9



A = I.D. of cylinder or O.D. of cup packing
F = Follower plate
H = Height of cup packing
T = Thickness of cup packing
θ = Angle of bevel to horizontal
A′ = O.D. of expander at heel
C′ = O.D. of expander at lip in free position
H′ = Height of expander
T′ = Thickness of expander

EXPANDER FOR CUP PACKINGS

The use of an expander is good practice in any cup application — it keeps the packing in contact with the area to be sealed at all times. However in the majority of cases, the expander is not essential, and the extra cost of tooling up, fabricating and installing expanders is not warranted. The following cases do call for the use of expanders:

1. where particularly light, flexible cups are used.
2. where sudden pressure differentials occur.
3. where part of the stroke is manual and the cup is expected to suck in fluid to keep the cylinder full.

Expanders are also used in cases where the cylinder is slightly out of round or where there is a variation in diameter from one part of the cylinder to another. In some appliances, where long periods of stand-by are expected, expanders help to keep the cup in contact with the cylinder wall and provide instantaneous seal when called upon to operate.

FINGER-TYPE EXPANDER

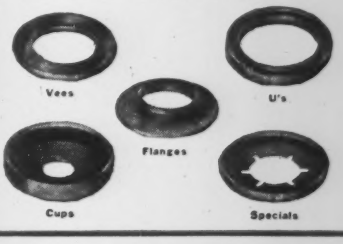
The most satisfactory type of expander is the finger-type. It is simple, efficient, easily installed, and requires only a slight change in diameter of follower plate (F). It is usually made of spring steel or phosphor bronze.

It is not possible to establish a set formula for the design of all finger-type expanders. Variations in equipment, size, pressures, materials are all factors that have a bearing on expander design. However, the following general rule is a safe starting point:

$A' = A - 2T - 2T'$
C' (in free position) $= A - 2T'$
$H' = H - T$
T' = Optional (to be determined by the material used for the expander and the amount of tension required)

SPARTAN LEATHER PACKINGS

Graton & Knight's SPARTAN has highest resistance to abrasion and heat (withstands boil test), is unaffected by common pressure mediums, and will not dry out hard and brittle. It also has exceptional tear and tensile strength. When your design reaches the "packings point" —or when packings trouble occurs—call on G&K engineers.



World's Largest Manufacturer of Industrial Leather Products

SPARTAN ENGINEERED PACKINGS

GRATON & KNIGHT COMPANY

Worcester 4, GRATON AND KNIGHT Massachusetts

HAVING MOISTURE TROUBLE?

SIMPLY APPLY UNIBESTOS

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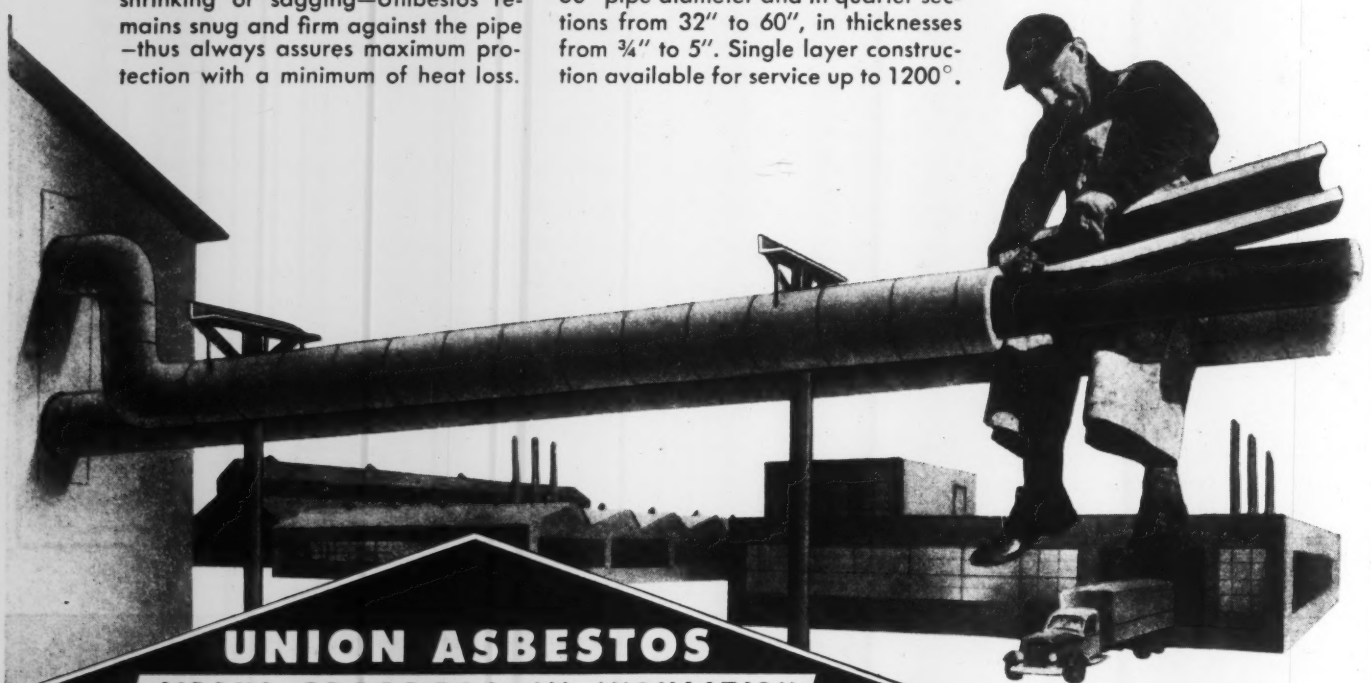
Unibestos efficiency is unaffected by excessive moisture—is ideal for outdoor work or underground mains. Even when Unibestos is soaked, moisture can be steamed off without damaging its structural strength. No shrinking or sagging—Unibestos remains snug and firm against the pipe—thus always assures maximum protection with a minimum of heat loss.

Available in half-section form up to 30" pipe diameter and in quarter sections from 32" to 60", in thicknesses from ¾" to 5". Single layer construction available for service up to 1200°.



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AND RUBBER CO.

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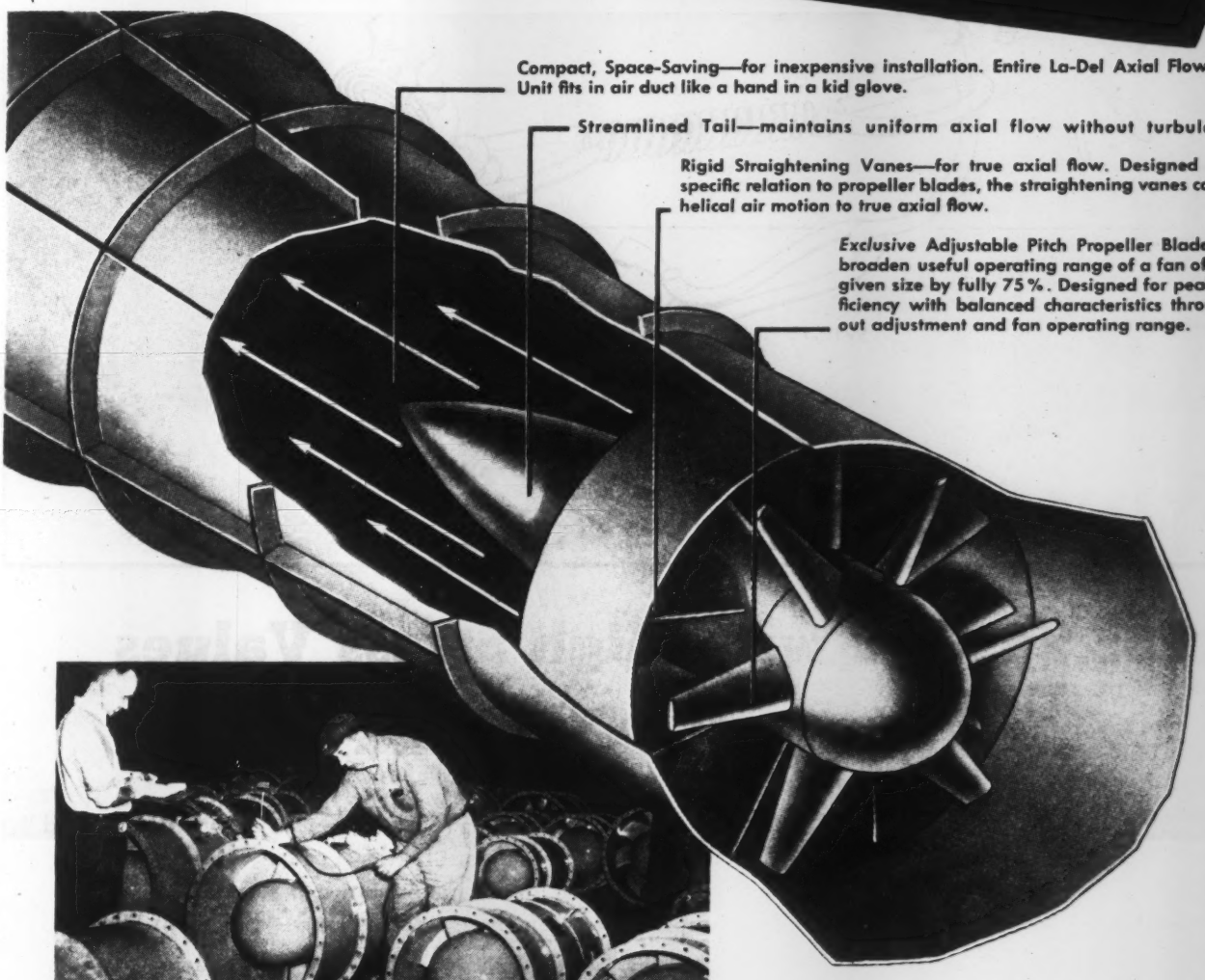
La-Del Axial Flow Fans Give You —

Space-Saving Installations
EXCLUSIVE Air Controlability

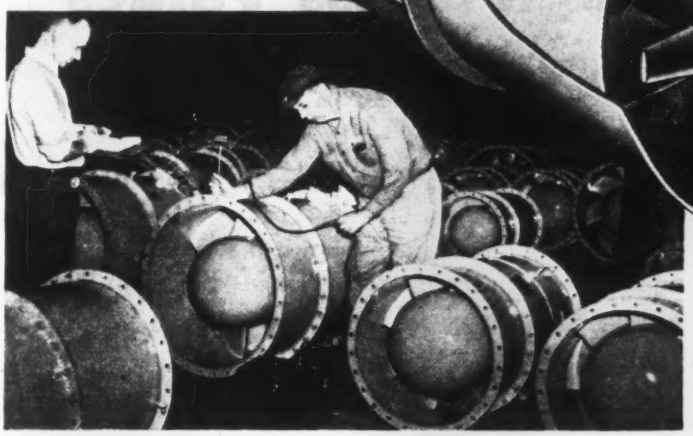


Compact, Space-Saving—for inexpensive installation. Entire La-Del Axial Flow Fan Unit fits in air duct like a hand in a kid glove.

Streamlined Tail—maintains uniform axial flow without turbulence.

Rigid Straightening Vanes—for true axial flow. Designed with specific relation to propeller blades, the straightening vanes correct helical air motion to true axial flow.

***Exclusive* Adjustable Pitch Propeller Blades — broaden useful operating range of a fan of any given size by fully 75%. Designed for peak efficiency with balanced characteristics throughout adjustment and fan operating range.**



La-Del efficient production planning, modern manufacturing methods and facilities, expert design and engineering guarantee you the best in post-war ventilation.

LA-DEL PIONEER Axial Flow Fan

Scientific air flow that guarantees new efficiencies and economies in all types of Industrial, Domestic, Marine and Commercial ventilating systems.

PERFECT *AIR* CONTROL—LaDel's *exclusive* adjustable pitch propeller blades assure complete air control at all times, under all conditions. Most modern and efficient of all ventilation methods, the axial air flow principle immeasurably adds to the effectiveness of all duct-type ventilating systems. Outstanding method of ship ventilation, La-Del's entire axial flow fan production now goes aboard U.S. fighting ships.

VENTILATION—AFTER VICTORY—For space-saving efficiency, reduced operating cost, unexcelled performance, quiet operation and freedom from maintenance troubles—remember LA-DEL when planning post-Victory ventilation.

★ BUY MORE AND *MORE* WAR BONDS ★

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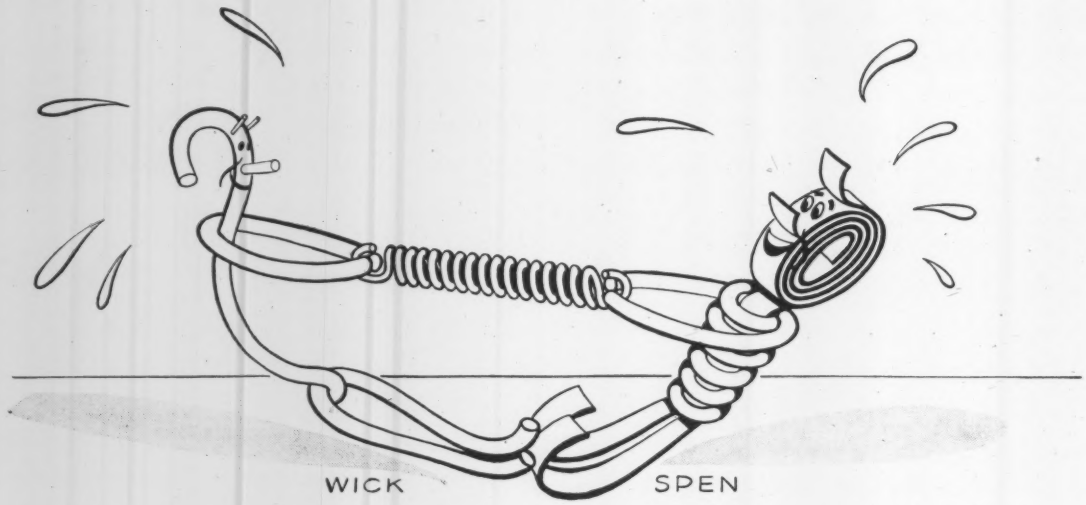
CONVEYOR AND MANUFACTURING CO.

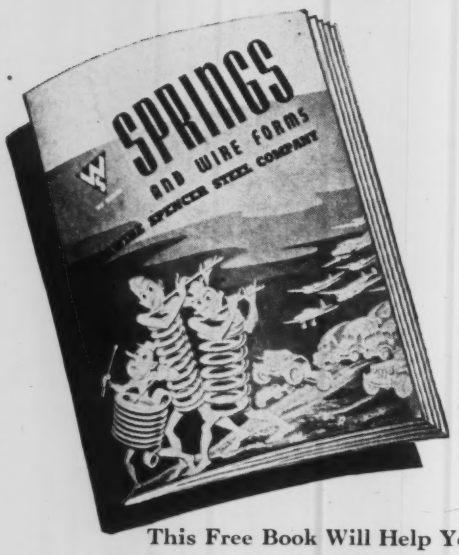
New Philadelphia, Ohio

ENGINEERS OF LA-DEL AIR MOVEMENT

ORIGINATOR AND PIONEER MANUFACTURER OF AXIAL FLOW FANS



For Springs with High Stress Values call WICK and SPEN



This Free Book Will Help You

Our book "Springs and Wire Forms" contains valuable technical information, formulae and tables relating to spring performance. Write today for your free copy. Spring Division, Wickwire Spencer Steel Company, New Bond Street, Worcester 3, Mass.

The dimensions of a spring are determined not only by load and deflection requirements, but by the elastic and fatigue limits of the material used in its manufacture. Establishing a proper relationship between these factors requires judgment based on engineering knowledge and experience.

Because our spring and formed wire specialists have had years of experience they are often called upon to help solve perplexing problems involving the use of springs. We engineer every conceivable type of spring, and, to insure top-flight performance, we make the steel in our own open hearths—draw, form, temper and test it in our own mills.

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The Stover Self-locking Nut is a beautiful example of precision manufacturing—but it "packs tremendous stamina." Sixteen precision machines are employed to make and test it—and to give the vibration-defying ***grip*** that spotlights the Stover nut among modern fasteners.

New in principle, the Stover Self-locking Nut represents a notable advance over other locking devices, especially in its employment of the natural elasticity of metal to give it holding power; its one-piece construction without complicated assembly, and its ability to lock firmly at any point on the bolt.

Evidence of the efficiency of the Stover Self-locking Nut multiplies rapidly in war production where, under Army-Navy specifications, it is giving exceptional resistance to the loosening effects of vibration.

For
BETTER AFTER-THE-WAR MACHINES

Every machine that vibrates will be a better machine if fastened with Stover Self-locking Nuts. Ask to have our representative call on you in relation to your post-war plans.

● *May we send you descriptive literature and samples?*

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"IT WON'T SHAKE LOOSE"

STOVER LOCK NUT AND MACHINERY CORPORATION

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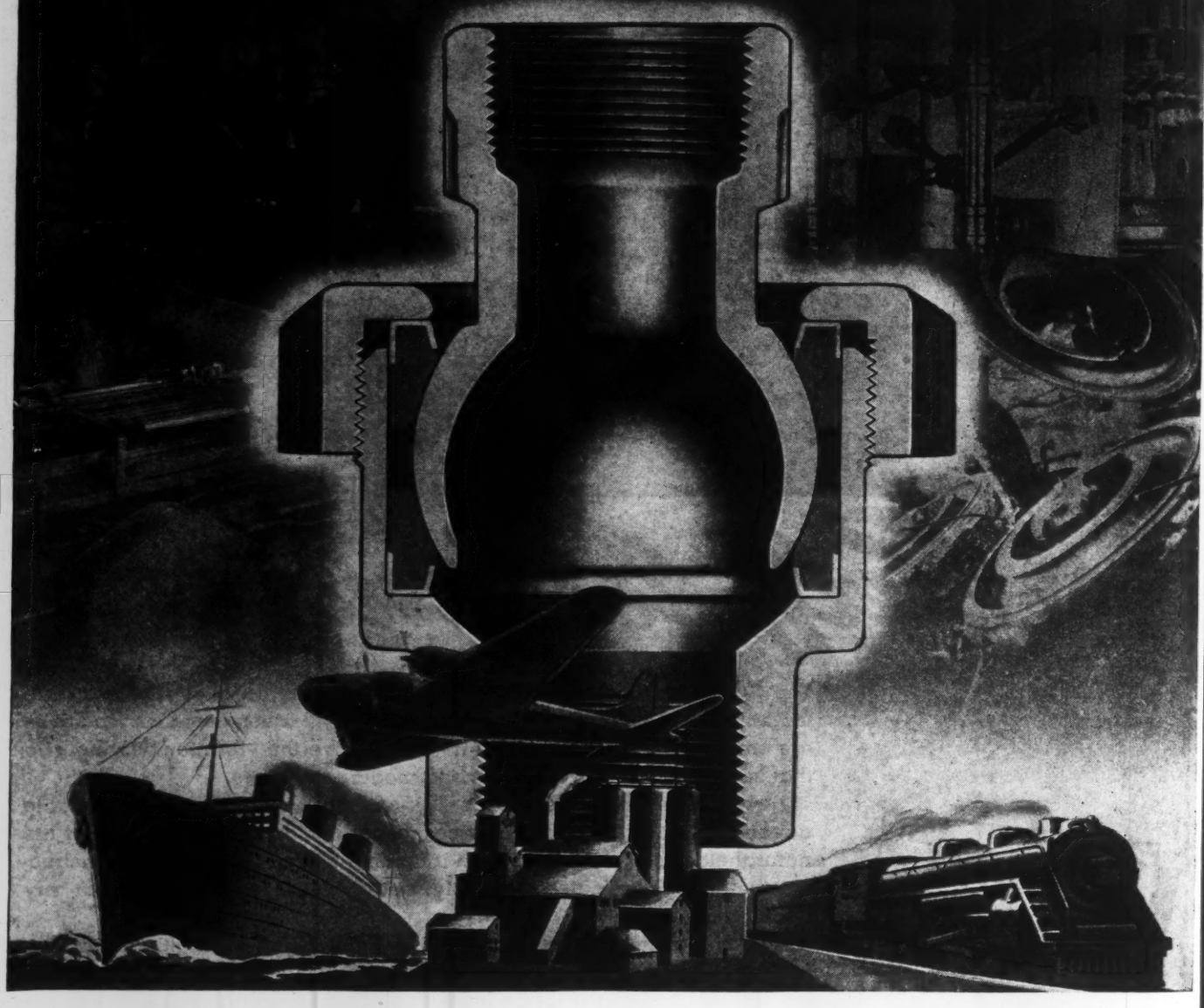

Fluid-conveying pipes carry the life-blood of industry and transportation. Vital links in these conveyor systems are Barco Flexible Joints—enemies of vibration and shock. Providing responsive movement through every angle, Barco compensates for all stress and strain, expansion and contraction. Over 30 years' experience in solving flexible joint problems is yours when you consult Barco's engineering department.

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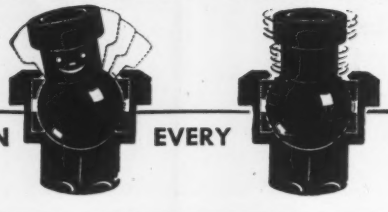
Not just a swivel joint...but a combination of a swivel and ball joint with rotary motion and responsive movement through every angle.



"MOVE IN EVERY DIRECTION"

THE FREE ENTERPRISE SYSTEM IS THE SALVATION OF AMERICAN BUSINESS

IF YOU THINK IT'S ONLY SALES TALK...

Try an Eldorado pencil at your drafting board! The proof is in the using —and an Eldorado gives you superlative proof of

uniform, accurate grading
smooth responsiveness
strength under pressure
flawless, opaque lines

If you are not using an Eldorado—make the acquaintance of America's finest drawing pencil. Send for a Comparison Sample by filling out and mailing the coupon below.

With the pencil, we'll also send a complimentary copy of "I Shall Arise" —a portfolio of Typhonite Eldorado pencil reproductions by Samuel Chamberlain. The subjects are buildings of artistic and historical importance bombed by the Nazi Luftwaffe early in the war. The portfolio is most appropriate at this time as a magnificent memento of the culture and the courage of the countries now rising again as the Allied Nations liberate them, one by one.

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Please send me a Comparison Sample of Typhonite Eldorado drawing pencil in.....degree. Also the Portfolio of drawings, "I Shall Arise".

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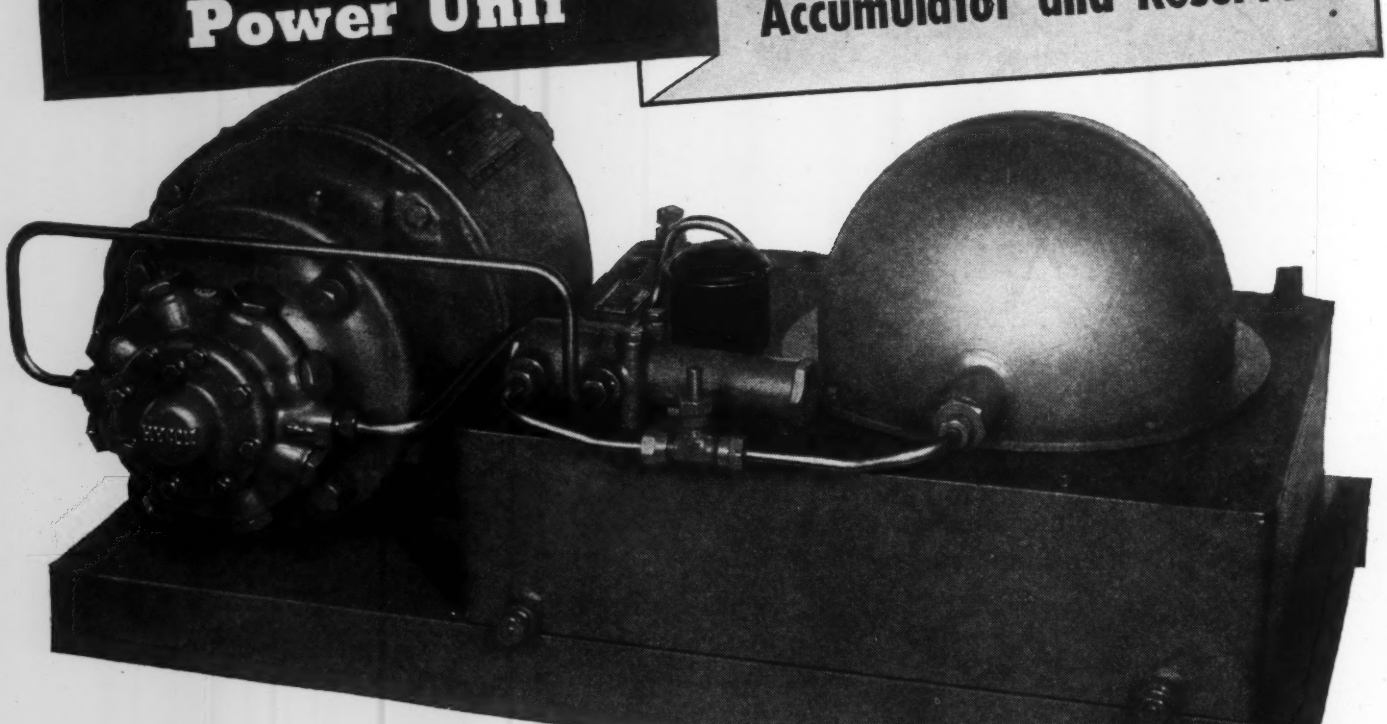
3000 p.s.i. Hydraulic Power Unit

3 HP Motor
8 cylinder Pump
Unloading Valve
Accumulator and Reservoir



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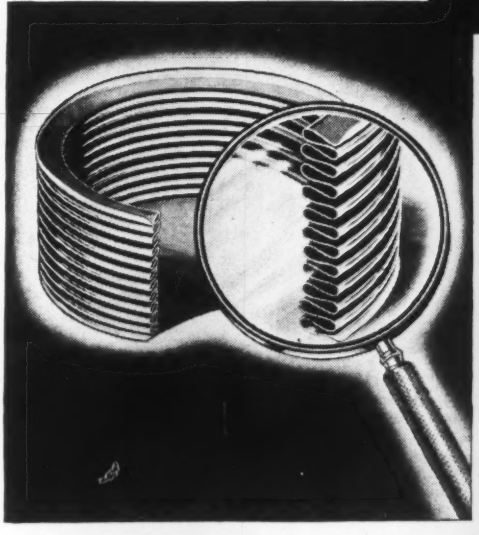


NOTE UNIT CONSTRUCTION. **Bellows is a one-piece expansible and collapsible member. Side-walls are deeply folded or corrugated as pictured above. No seams or solder.**

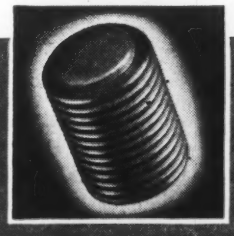
TIRELESS WORKER!

HOUR AFTER HOUR . . . day in, day out . . . a bellows proves a tireless worker *if it fits the job.*

Actually, there's only one best type and size for a particular application . . . the bellows that is engineered to meet all conditions encountered in actual usage.

That is why much care should be taken when selecting a bellows . . . why our engineers insist upon exact data covering every phase of the working conditions under which each bellows is to operate. With these facts at hand they can assure the dependable performance for which Bridgeport Bellows are famous.

Why not consult Bridgeport now regarding your present or post-war bellows requirements? Catalog XM-100, full of valuable information, will be sent upon request.



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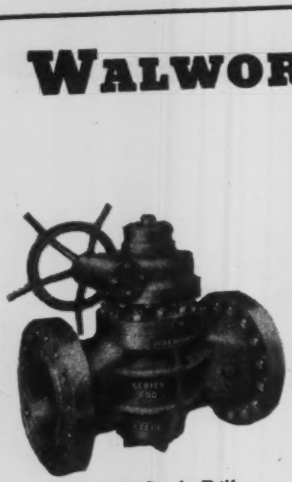
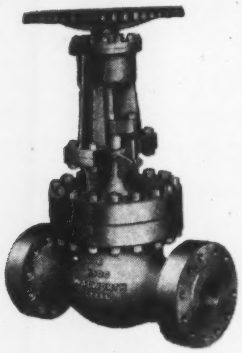


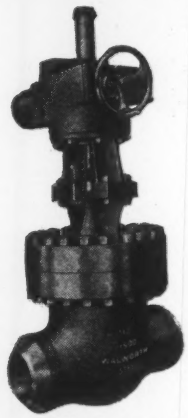
Walworth Steel, Ball-Bearing Type Lubricated Plug Valve

Walworth Series 300 Steel Gate Valve

Walworth Series 600 Steel Globe Valve



Walworth Series 1500 Steel Gate Valve



Walworth Series 1500 Motor-operated Steel Gate Valve with Welding ends.

Since 1842, Walworth has continuously manufactured valves and fittings for every piping requirement. This unmatched background of experience in valve design and manufacture has given Walworth valves their outstanding reputation for dependability, economy, and long service life.

Walworth Cast Steel Valves — made in a complete line of types and sizes — are excellent modern examples of Walworth valve leadership. They combine the latest features of advanced valve design with the traditional manufacturing skill which has made Walworth valves famous throughout the world.

See your Walworth distributor for further information on Walworth steel valves, or write for a free copy of Catalog 42. It describes Walworth's complete line of valves and fittings in steel, bronze, and iron.

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The unique laboratory at the Goetze plant, continuously engaged in research in the effects of metallic structure upon gasket performance, the determination of true gasket yield stress value and gasket factor, proper flange and bolt specifications, etc., has amassed a wealth of original data of interest to engineers and designers of pressure equipment.

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Also available — a handy up-to-the-minute gasket chart showing the cross sections of 36 most popular gasket types, their purposes and the characteristics which fit them for the specific services intended — is yours for the asking.

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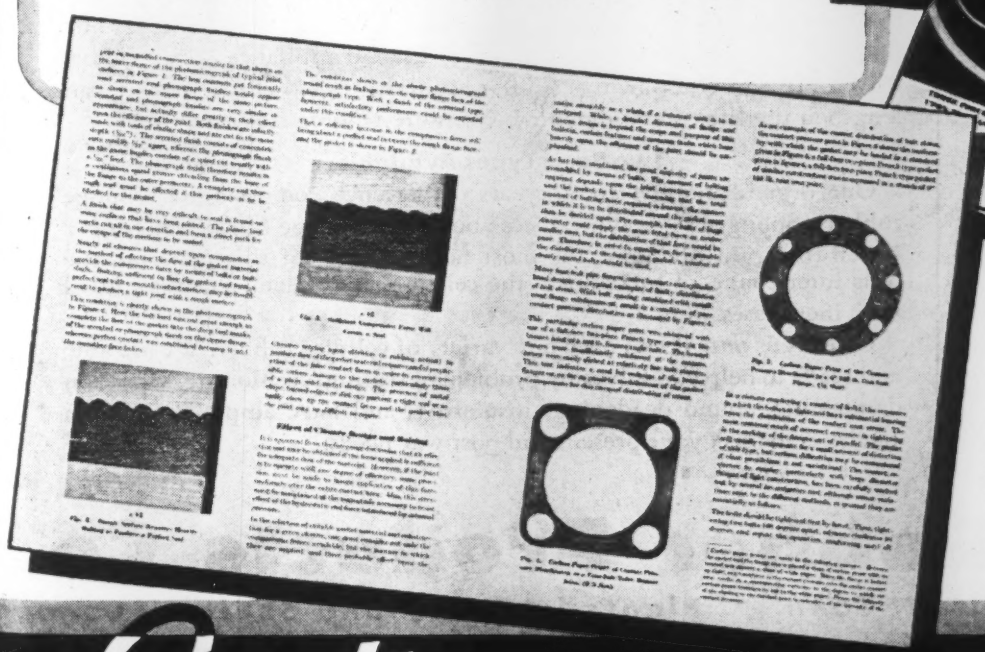


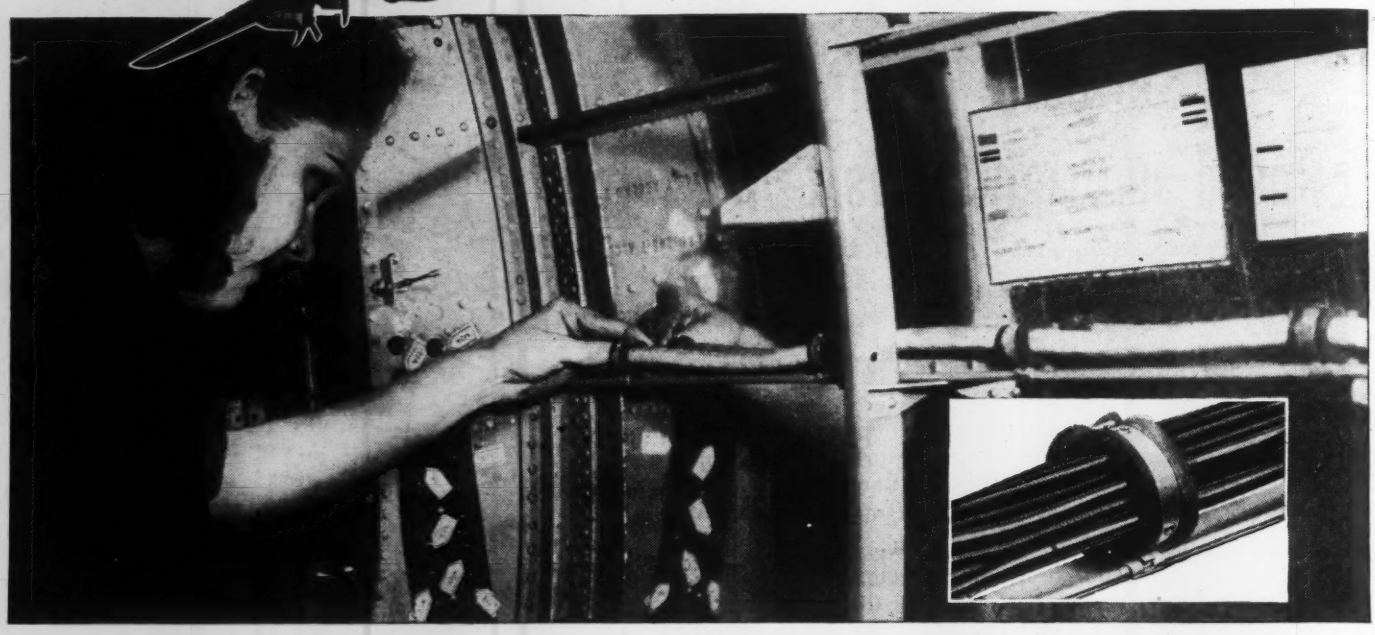
LOWELL THOMAS Speaks on New Gasket Film

Now available to employee groups, technical societies, engineering schools and other organizations throughout the country, this new 35-minute Kodachrome film, "Only a Gasket," tells why these are the "Biggest little things" in modern Industry. Write for full information

Goetze for GASKETS

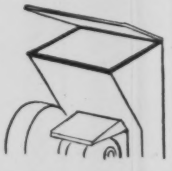
"America's Oldest and Largest Industrial Gasket Manufacturer"

Girl in bomber fuselage is tightening one of the hundreds of wire harness bands used on each Boeing B-29 Superfortress. Bands are supplied by United-Carr Fastener Corp. Each band is lined with cellular rubber, produced by Sponge Rubber Products Co., to cushion, insulate and prevent chafing. Parts are small – but they do a big job in protecting wiring against vibration of four 2200 h.p. motors and the recoil of Superfortress guns.



Available NOW for Industrial Production

We compound cellular rubber to your specifications – have developed methods of controlling resiliency, cell structure, tensile strength, and resistance to heat, cold, moisture, oils, acids, corrosive vapors, and abrasion. If sheet material does not solve your problem of cushioning sealing, sound deadening, insulating, or vibration dampening, we can supply you with tubing, cord, slabs, strips, or molded parts. Describe your requirements; our technical staff will tell you frankly whether or not cellular rubber will do your job.



THE RUBBER COLLAR THAT TOOK THE 'RUB' OUT OF WIRE HARNESS

. . . A lesson in post-war progress from a Boeing Superfortress

The tiny strips of cellular rubber that cushion the hangers for wires in the B-29 Superfortress cost just a few pennies. But what a man-size job they do! They soak up vibration . . . prevent chafing . . . keep wires in condition to "keep 'em flying"!

Wherever there is a danger of vibration – in an automobile, an airplane, a railroad train, a machine tool, a home appliance – *any* motor-driven piece of equipment – similar applications of cellular rubber can lengthen the life of equipment; help assure trouble-free operation.

Two Basic Types Available

Our organization, with 21 years' experience compounding sponge rubber (Spongex*) also produces another basic type of *cellular rubber* – Cell-tite*. In Spongex, the most familiar type of this material, the cells inter-connect. In Cell-tite the cells are individual, separate, filled with inert gases.

Consult us *now* if you need any variety of cellular rubber. We are able and ready to help you solve any problem of sealing, cushioning, vibration dampening, sound deadening, insulating, and have ample production facilities to meet your present and post-war needs.

* Trade Mark Registered

Sponge Rubber Products Co.

129 Derby Place, Shelton, Conn. • Plants in Derby and Shelton, Conn.

Sales Offices: NEW YORK • CHICAGO • WASHINGTON • DETROIT

World's Largest Manufacturer of Cellular Rubber Products

Trail

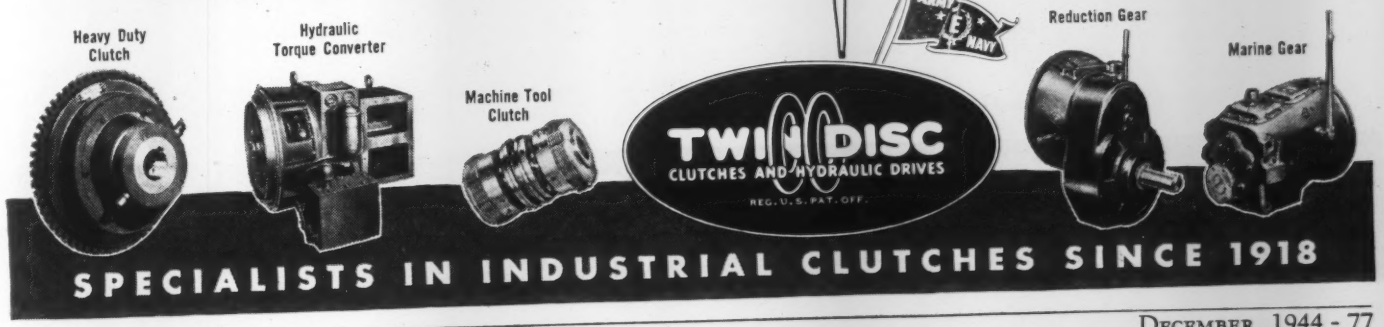
WITHOUT A TURN

It's in his blood, this sourdough son of a forty-niner. He can tell you of the Klondike where the "pay dirt" ran 15 ounces to the pan . . . or of many another rich diggings where a man could make his pile and quit—but seldom did.

For this grizzled prospector, the quest for gold is an endless trail from which there is no turning back . . . a trail that has no turn. For the Twin Disc Clutch Company, the quest is not for gold—but for ever more efficient methods of linking driving and driven members of the powered equipment you design, build or operate.

To the pursuit of this objective, Twin Disc has devoted more than 26 years. This quarter-century's experience is today reflected in the comprehensive line of Twin Disc power links—both friction clutches and hydraulic drives—which assure the accurate control and transmission of power in virtually all industries. It is reflected in the new developments in materials and in the advanced manufacturing techniques which have endowed Twin Disc products with the essential quality of long and efficient wear-life. And finally, this experience is reflected in the country-wide service and parts organization provided for the protection of every Twin Disc user.

If the plans you now have on the boards involve a power linkage problem, you stand to gain by calling on Twin Disc "know how". The recommendations of Twin Disc engineers will be impartial as to "friction or hydraulic" . . . freely given without obligation. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).



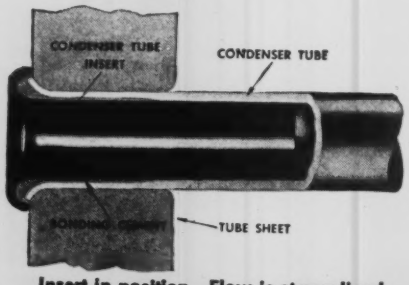
SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

Make CONDENSER TUBES *Last Longer!*

Install JOHN CRANE
CONDENSER TUBE INSERTS

Unprotected condenser tubes most often fail at the inlet end; the section most vulnerable to pitting and thinning. The John Crane Condenser Tube Insert *armors* the belled mouth and entrance section of the tube—*completely eliminates inlet end air erosion and sand abrasion;* helps to prevent outages.

These Inserts are molded of a *hard, wear-resistant* bakelite material, unaffected by temperatures to 275° F. and resistant to contaminated salt or fresh water. Installation is easy on old or new tubes: simply slip the Insert into place. Available for 5/8" and 3/4" 16 gauge, or 5/8", 3/4", 7/8" and 1" 18 gauge tubes.

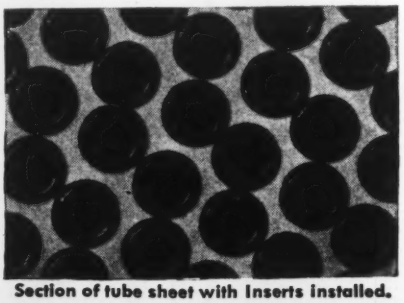


Insert in position. Flow is streamlined.

Service tests over a long period of time show that John Crane Condenser Tube Inserts

- Greatly lengthen tube life
- Save critical metals
- Pay for themselves many times

Send for illustrated bulletin, or consult our branch office nearest you for full information.



Section of tube sheet with Inserts installed.

CRANE PACKING COMPANY
1814 CUYLER AVENUE • CHICAGO 13, ILLINOIS

TWO HEADS ARE BETTER THAN ONE

RECONVERSION means IMPROVEMENTS

Alert engineers are receptive to the advantages of Roller Chain Drives

If you investigate major machinery developments made during the past 40 to 50 years, you will discover a striking fact—so many of the radical advancements took place coincident with the application of DIAMOND Roller Chains.

● When greater efficiency in farming became necessary and agricultural machinery builders made important improvements after World War I, Diamond Chain engineers cooperated with them in adapting appropriate roller chain drives that are regularly used by scores of leading manufacturers in this field.

● Over 25 years ago increasing need for gasoline and oil brought about the engineering of compact high-speed Diamond Chain driven oil field rigs to replace separate power plants and slow-speed rig combinations. Throughout the years of greater oil production DIAMOND Drives have been employed on America's finest oil country machinery.

● Serving well as precision timing drives on diesel engines from the earliest days, successively led to wider use of Diamond Roller Chains by leading engine builders. These drives include water, lube and fuel oil pump operation, exciters, generators, air compressors, tachometers, governors, and, more recently, super-charger blowers.

● Another "in-at-the-inception" DIAMOND application dates back to the first successful power airplane flight at Kitty Hawk in 1903 where Diamond Chains drove the propellers. Today scores of other uses have been found for these versatile chains on fighter, bomber and transport planes—for bomb release mechanisms, retractable landing gears, bomb hoists, and—for the vital controls of elevators, flaps, ailerons, etc.

● Construction machinery builders, whose equipment has done so much to help win the war, began using Diamond Roller Chain Drives 30 years ago, since when tremendous developments in this field have taken place.

● Cases no end can be cited—all furnishing proof of the wide adaptability; tremendous reserve strength and inherent elasticity; high maintained efficiency (98-99%); the equal suitability at short or long shaft center distances, high or low speeds, large or very small loads; advantages that give the machinery designer and builder unusual opportunities for product improvement.

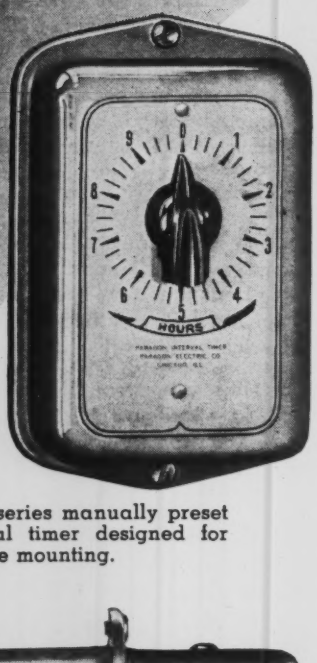
Practical suggestions by our experienced engineering staff may help answer your drive problems quickly. DIAMOND CHAIN & MFG. CO., 413 Kentucky Avenue, Indianapolis 7, Indiana.

DIAMOND ROLLER CHAINS

PRECISION CONTROL OF TIME INTERVALS

assured with Paragon

PRESET TIMERS

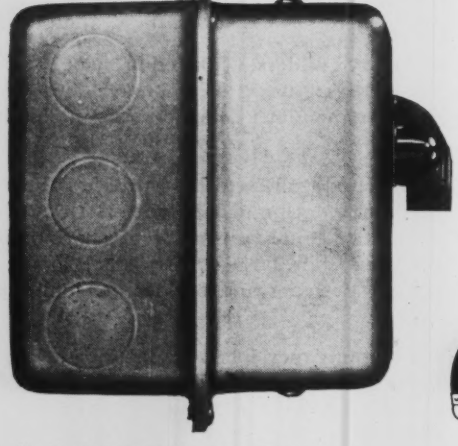


2509 series manually preset interval timer designed for surface mounting.

PARAGON improved manually preset timers can be preset to perform a great variety of operations . . . to allow a given operation to continue for almost any pre-determined time limit . . . to close or open a circuit at the end of the preset time.

This timer is synchronous motor operated. It assures absolute accuracy of the timing cycle and is not affected by vibration or changes in ambient temperature. Supplied as standard with single pole, double throw switches and choice of 10 time ranges and 3 types of mounting . . . 2400 series for flush mounting, 2500 for surface mounting, 2900 for wall mounting.

Write for complete bulletin . . . and for information about other timers, time switches, and time delay relays designed and built by Paragon time control engineers.



Also designed for standard single gang switch box or handy box mounting.

Paragon *Chicago*

BUILDERS OF ELECTRICAL EQUIPMENT . . . . SINCE 1905

PARAGON ELECTRIC COMPANY

39 West Van Buren Street

Chicago 5, Illinois

Mr. Tops, the Paragon symbol of top quality

CHECK *your present method of lettering* **AGAINST** *Vari-Typer Machine Lettering*

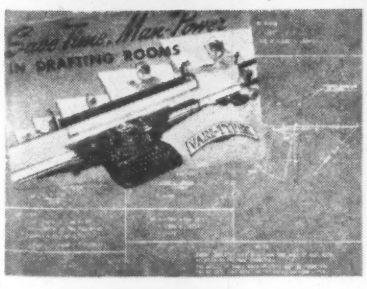
SPEED The Vari-Typer Lettering Machine offers the fastest method of lettering bills of material, notes, specifications on tracings or drawings. It is four to five times faster than hand lettering, and it speeds your drafting room output.

COST A girl typist operates Vari-Typer. She does in one day an amount of lettering which would take four or five draftsmen a day to complete. Using this ratio, and your employee salary scales, you can estimate savings possible by using the Vari-Typer. A western engineering concern *saved the cost of Vari-Typer in 19 working days.*

UNIFORMITY Because Vari-Typer Lettering is machine lettering, every letter and figure is uniformly clear and distinct. Errors due to mis-reading of poor hand lettering are minimized, and fewer drawings and tracings are rejected.

THIS FREE FOLDER TELLS THE STORY

To get a more complete picture of Vari-Typer, send for your copy of a 12-page illustrated folder. It will be sent promptly on request, and there's no obligation.



TEXT TYPE SET ON VARI-TYPER

RALPH C. COXHEAD CORPORATION
333 Sixth Avenue, New York 14, N. Y.

Send copies of Vari-Typer Folder.
Send a representative to demonstrate Vari-Typer.

NAME _____ TITLE _____

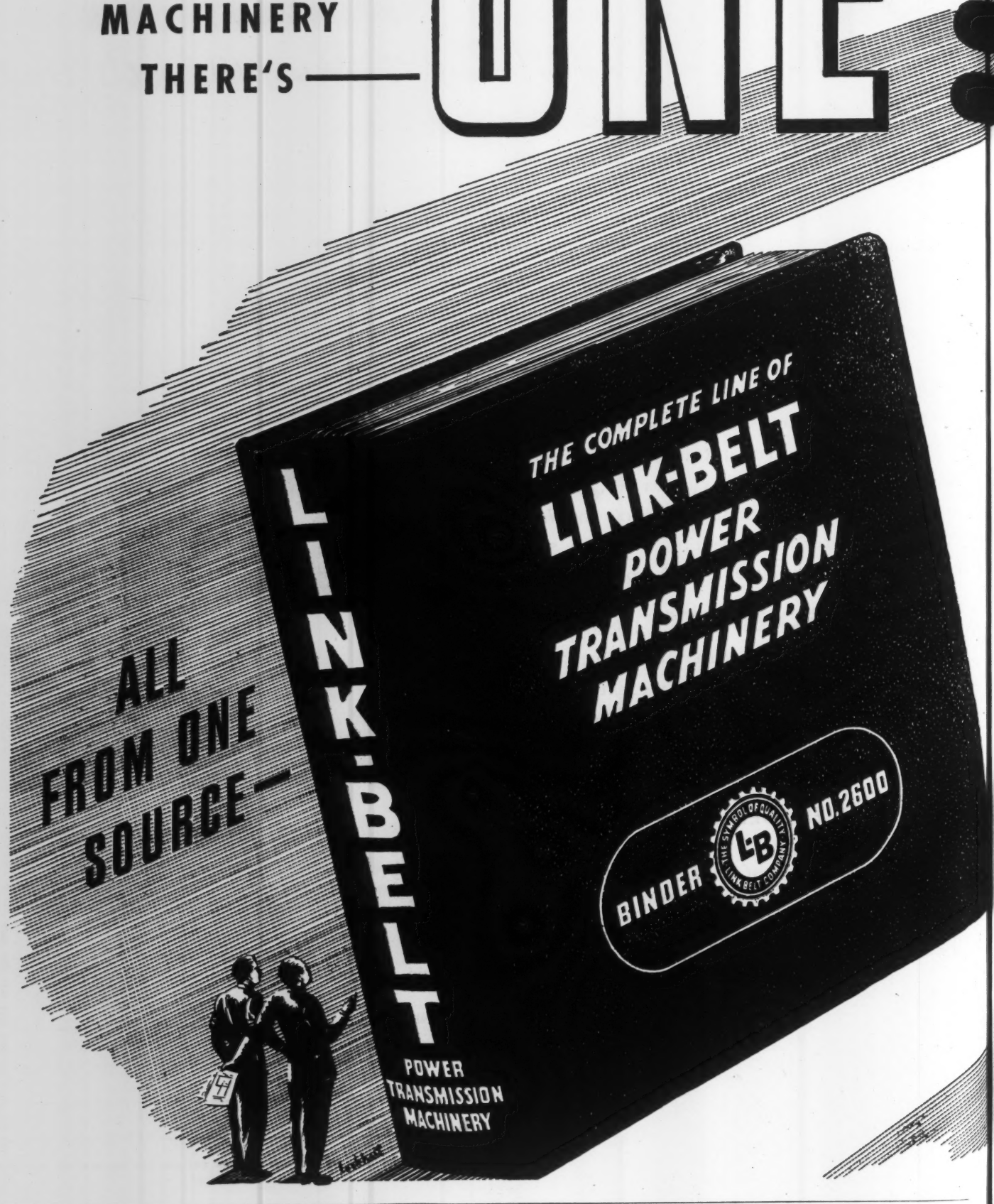
COMPANY _____

ADDRESS _____

CITY _____ STATE _____

7122

IN POWER TRANSMISSION MACHINERY THERE'S — ONE



..NAME TO REMEMBER

..DEPENDABLE SOURCE OF SUPPLY

..HIGH STANDARD OF QUALITY

..RESPONSIBILITY FOR PERFORMANCE

SILVERSTREAK SILENT CHAIN DRIVES—Catalog 125

SILVERLINK ROLLER CHAIN DRIVES Catalog 1957

DRIVE CHAINS—Malleable Iron, Promal & Steel Catalog 1994

ROLLER & BALL BEARINGS—Catalog 1775-A

ROLLER BEARING PILLOW BLOCKS All Types—Catalog 1775-A

BALL & ROLLER BEARING UNITS Duplex, Flange, Cartridge, etc.—Catalog 1775-A

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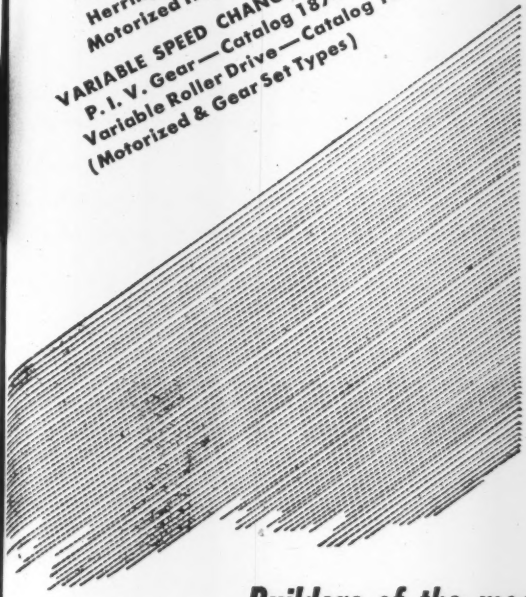
COUPLINGS—Rigid and Flexible—Catalog 2045

POWER TRANSMISSION ACCESSORIES Shafting, Collars, Base Plates, Take-Ups, Grease Cups, Hangers, Clutches, Pulleys, Gearing—Catalog 1997

SPROCKETS—Cut & Cast Tooth—Catalog 850

SPEED REDUCERS Worm Gear—Catalog 1824 Herringbone Gear—Catalog 1519-A Motorized Helical Gear—Catalog 1515

VARIABLE SPEED CHANGERS P. I. V. Gear—Catalog 1874 Variable Roller Drive—Catalog 1374 (Motorized & Gear Set Types)



● To the users of power transmission machinery this comprehensive line, designed, built and backed by LINK-BELT, offers a nationwide service that should save your time, simplify your procurement routine, assure the correct size and type for each application and the most efficient operation.

Profit by the advice of our experienced power transmission engineers, who are truly impartial in their recommendations. Individual catalogs on each type of power transmission machinery are available — Link-Belt Binder No. 2600 contains all of them. (Due to present wartime restrictions, only a limited supply of this large, complete binder is available now.) Copies of individual catalogs gladly sent on request.

9683

LINK-BELT COMPANY

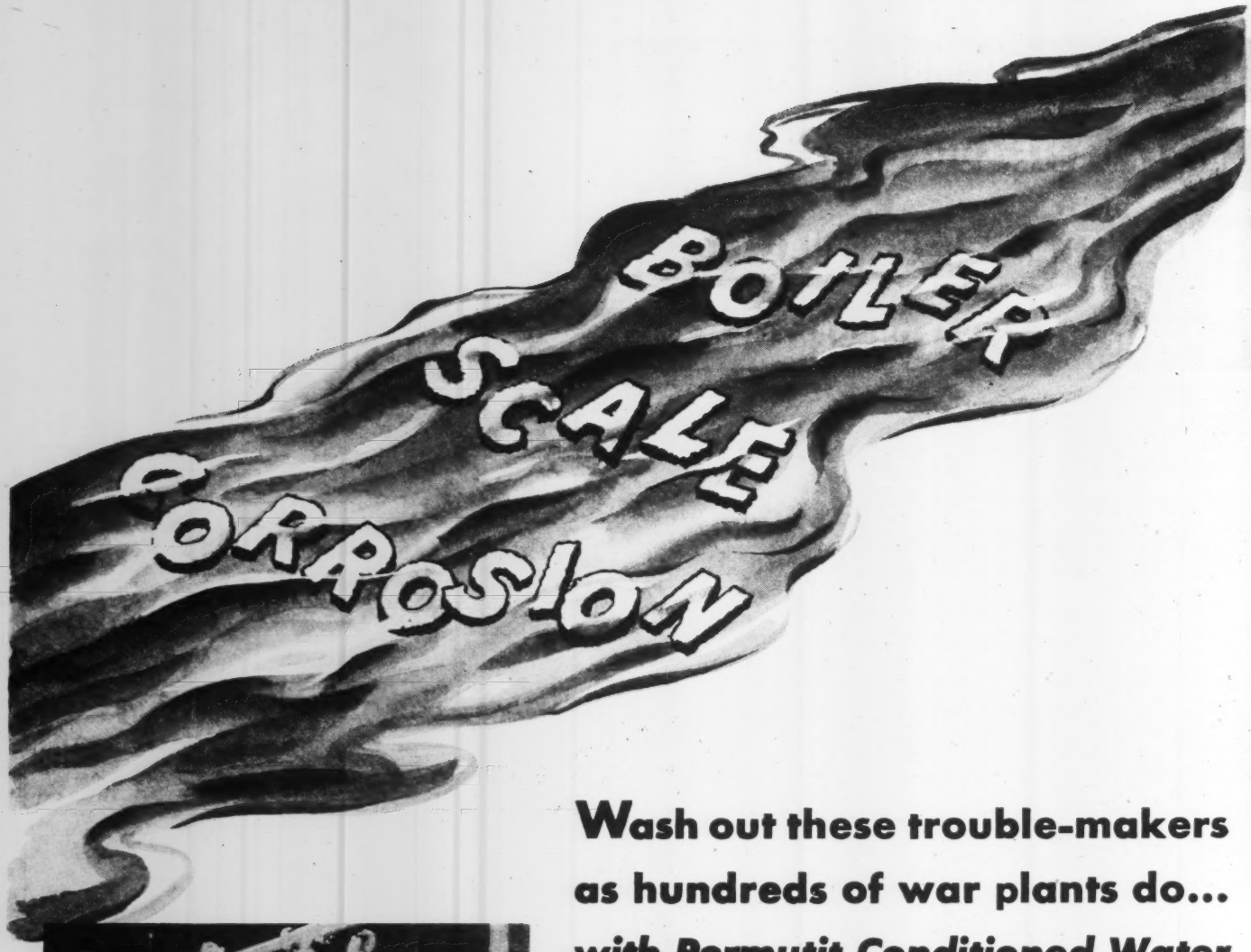
Chicago 9, Indianapolis 6, Philadelphia 40, Minneapolis 5, San Francisco 24, Atlanta, Dallas 1, Toronto 8.

Offices, Factory Branch Stores and Distributors in principal cities.

Chicago Plants · Indianapolis Plant · Ordnance Plant · San Francisco

LINK-BELT

Builders of the most complete line of POWER TRANSMISSION MACHINERY



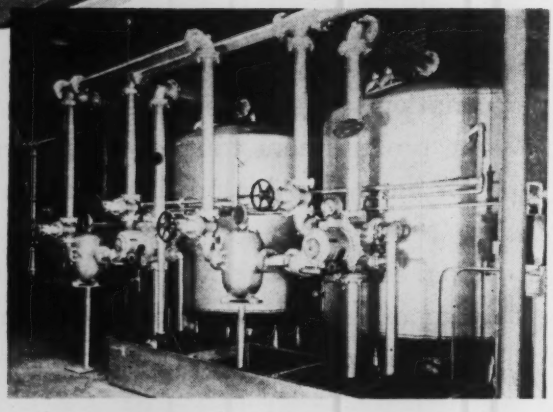
Wash out these trouble-makers as hundreds of war plants do... *with Permutit Conditioned Water*

BOILER-SCALE and corrosion mean slow-downs, possible shut-downs, right at the source of power—in the steam plant. Permutit* helps prevent these troubles by treating the feed-water *before it enters the boilers.*

Permutit makes water conditioning equipment to suit every individual need. Processes include: Hot and Cold Lime Soda Softeners, Zeo-Karb* Water Conditioners, Spaulding Precipitators, Deaerating Heaters, Degasifiers, Silica Removal, Continuous Blowoff . . . and the new Demineralizers that produce a low-cost substitute for evaporated water.

Let Permutit help *you* to more efficient operation through better water. Address The Permutit Co., Dept. A3, 330 W. 42nd St., New York 18, N. Y. or Permutit Co. of Canada, Ltd., Montreal.

* Trademarks Reg. U. S. Pat. Off.



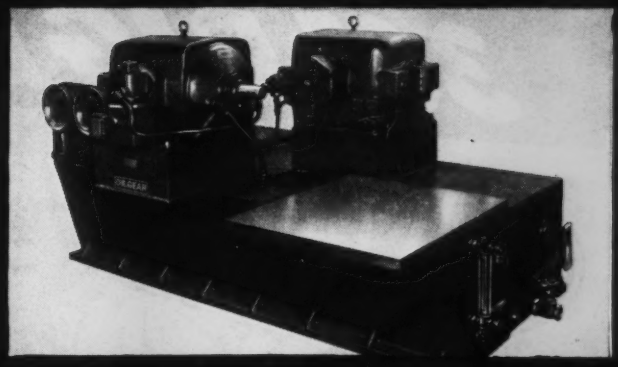
Permutit Zeo-Karb H Water Conditioner* removes both hardness and bicarbonates from water. Effluent contains no incrustants, is reduced in total solids and alkalinity. Alkalinity can be adjusted by mixing effluents from a Zeo-Karb H unit and a sodium zeolite unit.

Serving industry and the armed services . . . with GOOD WATER

PERMUTIT

WATER CONDITIONING HEADQUARTERS

Economical Oilgear Radial Rolling Piston power units are used to charge stationary and portable catapult power plants to catapult planes at flying speeds in something over 100 feet. Besides high linear speed obtainable over a wide range, acceleration and/or deceleration are controlled, power can be stored during idle period.



FROM ZERO TO FLYING SPEED IN A MATTER OF SECONDS

ARE YOU TRYING TO:

1. Apply large forces through long... or short... strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction... with or without preset time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light... or heavy ... forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R.P.M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full preset automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!

JUST ANOTHER EXAMPLE OF OILGEAR'S AMAZING ABILITY TO SOLVE THE PROBLEMS OF UNIQUE POWER TRANSMISSION

There is hardly any limit to the applicability of Oilgear Fluid Power. In catapulting heavy airplanes from the decks of carrier escorts, Oilgear not only furnishes the tremendous power required to accelerate the load from zero to flying speed in a few seconds but it accumulates this power with comparatively small, standard units while each plane is being maneuvered into position. *You* can use units of this type on other installations where tremendous power or high velocity is required intermittently, as in die casting machines, braiding and knitting machines, riveting presses, etc. Or if your machine power or transmission requirements lie far afield, they are almost certain to be met... better, more economically... in any of the scores of other functions Oilgear Fluid Power provides. Just as war industry built upon peacetime knowledge, so today shrewd designers are adopting the lessons learned in war. Put *your* problem up to Oilgear engineers; see if their solution isn't what you've been looking for. Do it *now*... THE OILGEAR COMPANY, 1307 West Bruce Street, Milwaukee 4, Wisconsin.

OILGEAR

Fluid Power

365 BIG DATES FOR A DOLLAR!

EXTREME LEGIBILITY

Each numeral 2¾" high—that's the feature of this beautiful new six-color POST 1945 Calendar—overall size 17" x 25". Each date of the week is designed to be legible from any spot in the drafting room. The entire current month with ultimate and proximate months appear on each weekly page. The calendar is in full, brilliant color and includes a section devoted to significant drafting room data, covering charts on wire and sheet metal gages, screw threads, bolt heads, pipe and pipe fittings, gears, metric equivalent, and complete twelve-month calendar. Price $1.00. (Free if your request is attached to an order for POST merchandise.)

ACTUAL SIZE

3

2¾"

The FREDERICK POST COMPANY • Box 803 • Chicago 90, Illinois

Attached find $1.00 for a Giant 1945 Post Wall Calendar. (The calendar is FREE if you attach this coupon, filled in, to an order for POST merchandise)

NAME _____ COMPANY _____

ADDRESS _____ CITY & STATE _____

Destructive heat...brittle cold

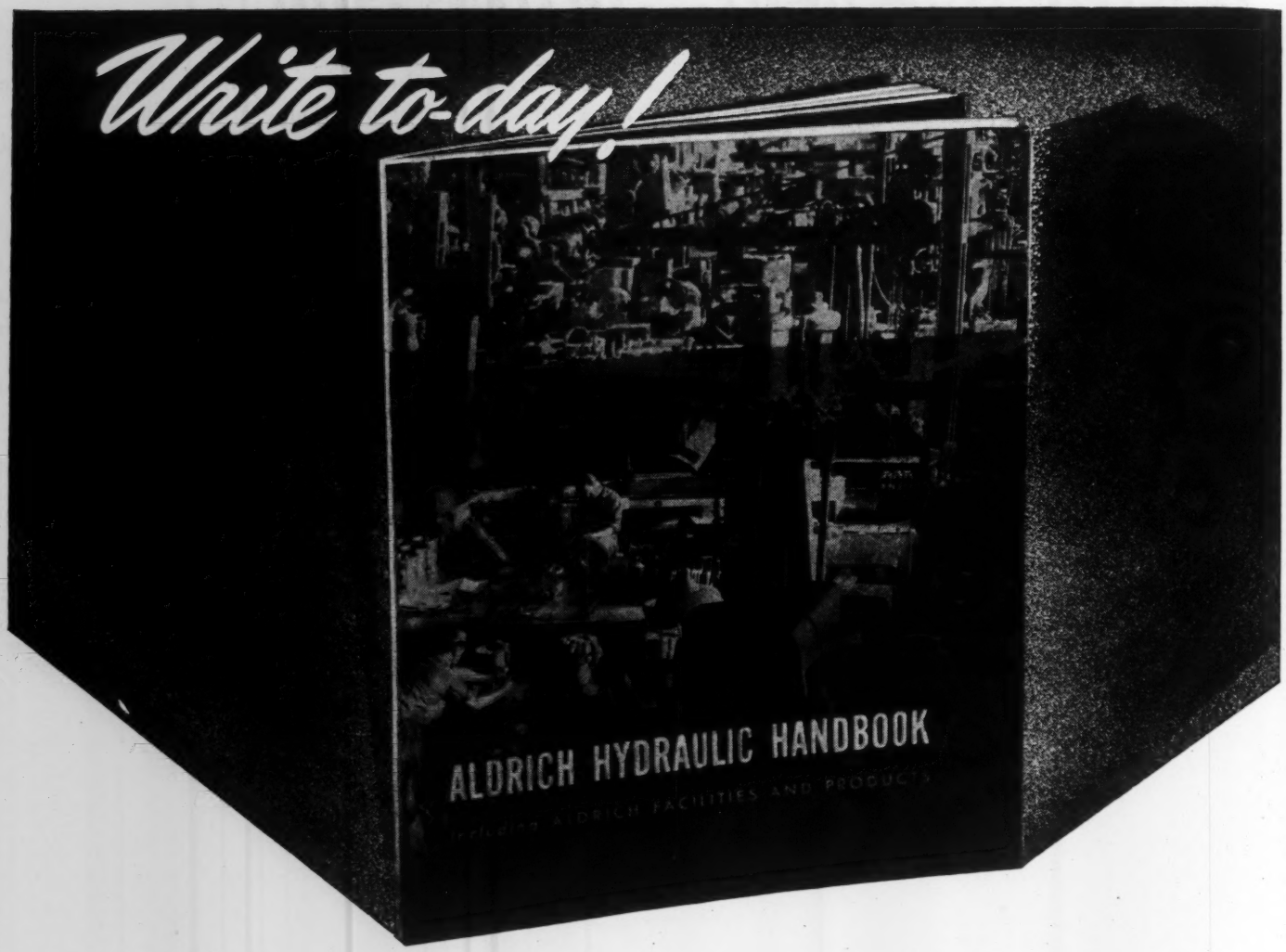
TITEFLEX FLEXIBLE TUBING remains flexible and pressure-tight under the widest range of temperature variations. We think, for instance, that you'll be interested in the problem of a phonograph record manufacturer . . .

• He makes records on presses like the one in our illustration, and he found the solution to supplying both *steam* and *cold* water to the stationary and movable platens by choosing Titeflex all-metal tubing.

• What a change from the temperatures and pressures of steam applications to -50°F. of high-altitude aircraft installations. Yet Titeflex remains perfectly flexible at -50°F., while other types of tubing become brittle from the low temperature. In addition — because it's *all-metal* — Titeflex is not affected by the destroying influence of oils, gasoline, and most chemicals.

• Undoubtedly the versatility of Titeflex will find many applications in your own plant for your wartime or postwar planning. We'd like you to write for our catalog No. 113 which gives specifications on Titeflex and which suggests many applications of which you might not otherwise think.

TITEFLEX, INC.
521 Frelinghuysen Avenue
Newark 5, N. J.



. . . FOR THIS HANDY REFERENCE BOOK

This new sixty-page edition of the Aldrich Hydraulic Handbook contains essential data and tables, conveniently indexed for use by those interested in the installation and operation of hydraulic pumps, piping and equipment. There are hydraulic formulae and definitions, tables of water head equivalents, friction losses, materials used to pump various liquids and charts showing ram speed and flow, discharge flow, to list but part of the useful information. Included also is a pictorial presentation of Aldrich manufacturing facilities as well as a condensed catalog of Aldrich products.

We shall be pleased to send you a copy of the Handbook, at no obligation. Write today.

● *The ALDRICH line . . . of power pumps is the result of over 40 years' experience in the design and manufacture of high pressure pumps and equipment for petroleum, power, mining, marine, metal working and other services.*

Bulletins and data sheets on any type of Aldrich pump, hydraulic machinery or specialty will be sent free on request.

ALDRICH

THE ALDRICH PUMP COMPANY

ALLENTOWN • PENNSYLVANIA

REPRESENTATIVES: BIRMINGHAM • BOLIVAR, N. Y. • BOSTON • CHICAGO
CINCINNATI • CLEVELAND • DENVER • DETROIT • DULUTH • HOUSTON • LOS ANGELES
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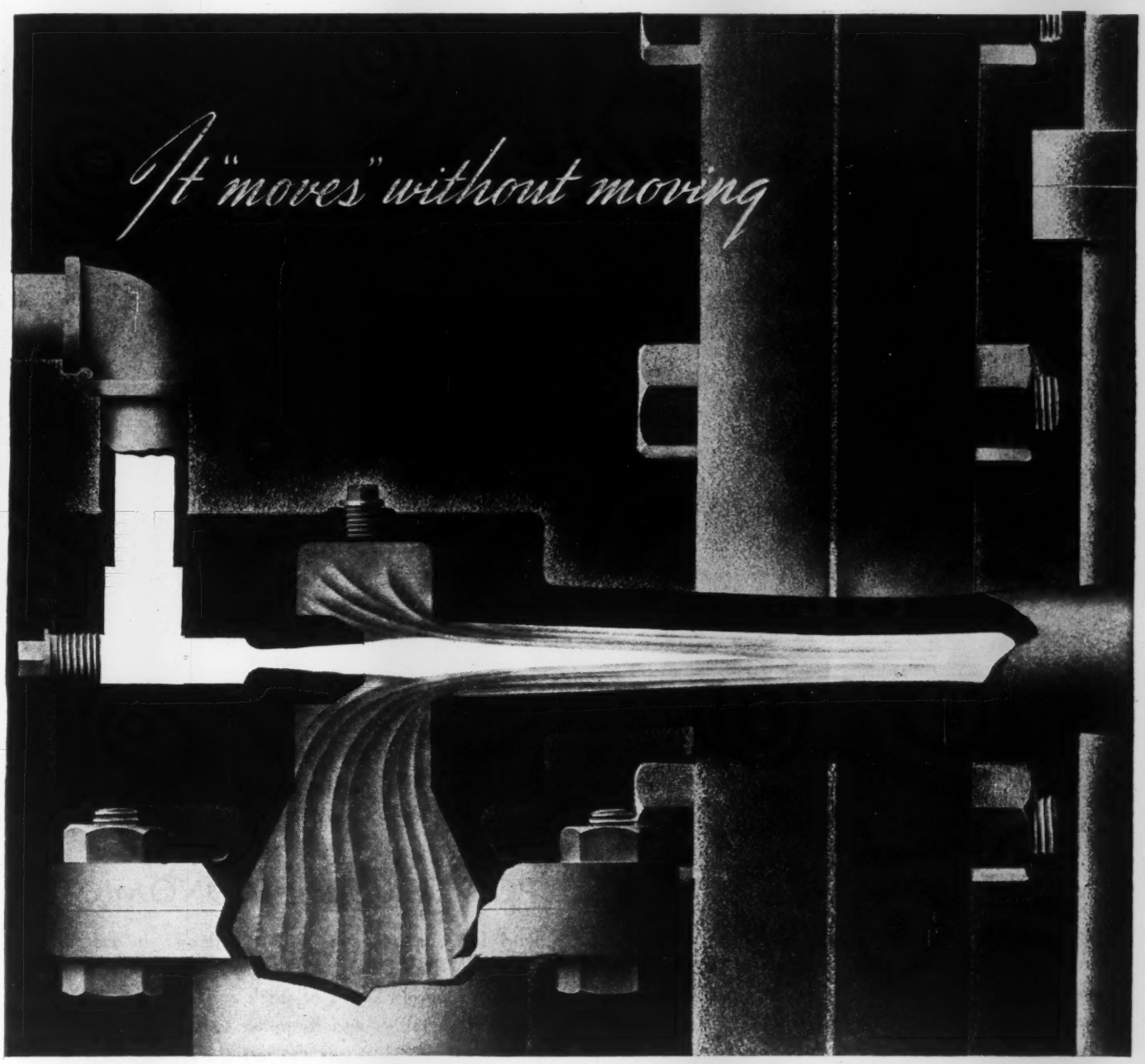


This pump, having *no* moving parts, is so fundamentally simple and trouble-free that it takes but little imagination to appreciate its advantages. Such pumps, which operate on the jet principle, have long been used to lift and transfer liquids and solids; to produce vacuum or pressure; to condense vapors; to mix gases; to heat and agitate liquids . . . and for many other purposes. They not only perform economically, but their simplicity assures continuous, trouble-free operation.

Where can you apply this time-tested, dependable jet principle to improve your process or to reduce the cost of your product? The research and engineering facilities of Schutte & Koerting, who have pioneered the application and development of jet pumps of all types since 1876, are available for consultation on your specific problems.

STEAM JET	LIQUID JET	AIR JET
Agitators	Agitators	Agitators
Compressors	Condensers	Compressors
Ejectors	Compressors	Ejectors
Exhausters	Exhausters	Exhausters
Heaters	Mixers	
Vacuum Boosters		

. . . both SINGLE- and MULTI-STAGE

Write today for Condensed Catalog J-2 which outlines many of the countless industrial applications of the jet principle.

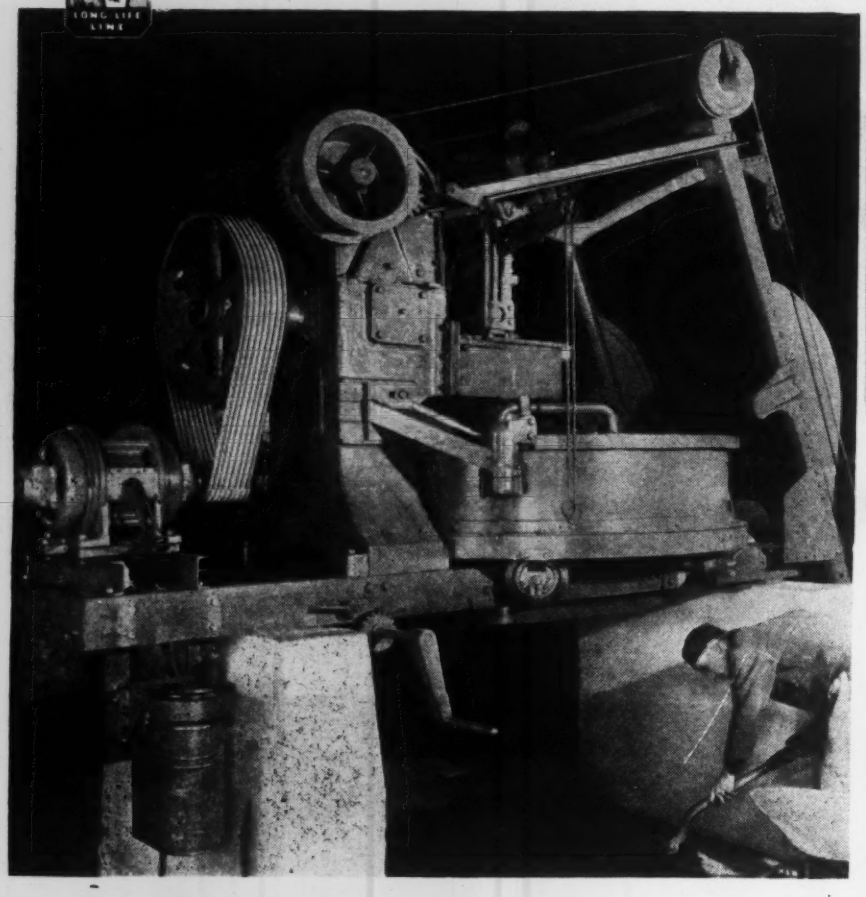
SCHUTTE & KOERTING CO.

MANUFACTURING ENGINEERS

1166 THOMPSON STREET

PHILADELPHIA 22, PENNSYLVANIA

Both facing and core sands are being mixed in this Symbol EA-4 "Lancaster" Mixer, open pan type fitted with elevator hopper. Photo courtesy Lancaster Iron Works, Inc., Lancaster, Pa.



Wood's V-BELT DRIVES

Here we have a WOOD'S V-Belt Drive on a "Lancaster" Mixer, used in the preparation of foundry sands. A 10 H. P. motor of 1200 r.p.m. provides 246 r.p.m. on the drive shaft of the mixer. V-Belt Drive is a most effective solution of the transmission problem involving high speed motors and low speed machinery.

V-BELT DRIVES . . . *EFFICIENT . . . POWERFUL . . . ECONOMICAL*

In any application of power transmission from source to driven machinery, V-Belt Drive will show maximum performance with minimum power loss and low maintenance costs.

V-Belt power transmission utilizing flexible, resilient, full molded belts and Wood's sheaves with precision machined, accurately spaced, perfectly designed grooves, is V-Belt Drive at its best.

The benefit of Wood's pioneering experience in 87 years service to American industry, can be yours.

Send for our 64-page V-Belt catalog. It describes Wood's V-Belt Drives in detail . . . including dimensions and weight tables of stock and standard sheaves, engineering tables and formulae to assist in selecting the correct drives to suit any requirements.

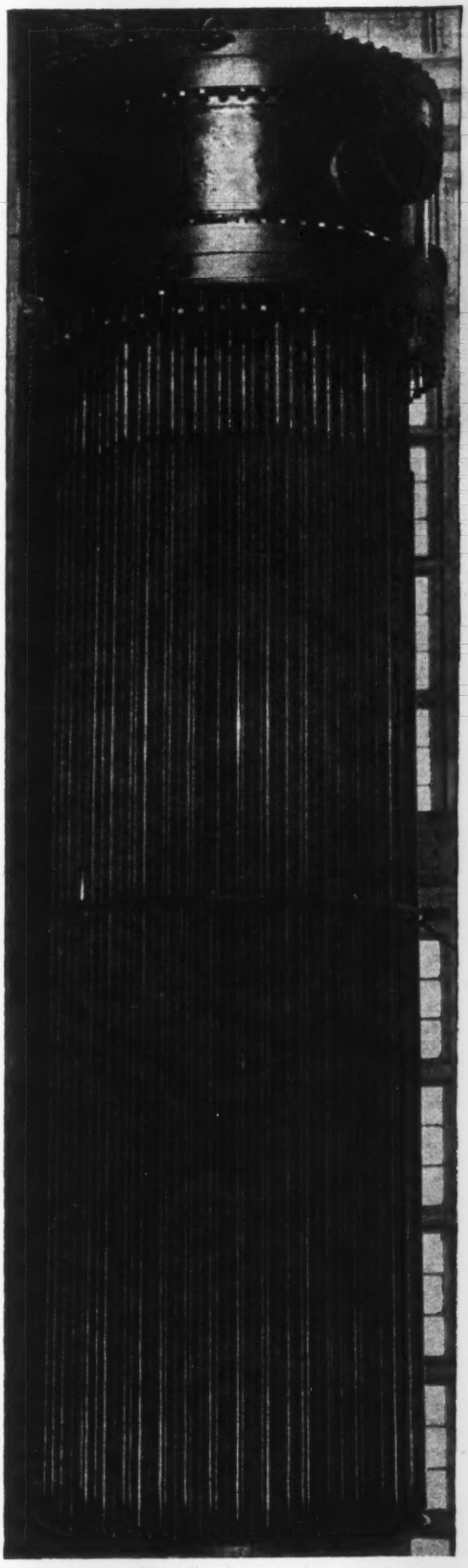
Engineering consultation welcomed . . . no obligation.

EVERYTHING IN TRANSMISSION

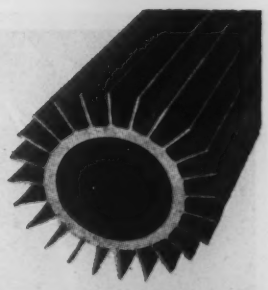
Bearings—Collars—Clutches—Couplings—Contactors —Hangers—Pillow Blocks—Pulleys—V-Belt Sheaves and Complete Drives

T. B. WOOD'S SONS COMPANY, CHAMBERSBURG, PENNA.

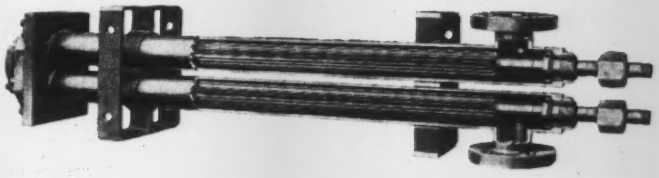
BRANCHES: 387-391 ATLANTIC AVE., BOSTON, MASS. • 83 PLANE ST., NEWARK, N. J. • 425 FIRST AVE., PITTSBURGH, PA.



Investigate G-FIN



COOLERS...CONDENSERS
HEATERS...EXCHANGERS



G-FIN . . . the pioneer finned-tube heat transfer surface with longitudinal fins . . . has PROVED its effective principle and also its superior construction in many tens of thousands of installed units, some of which have been in service for well over 10 years.

The illustrations in this advertisement show two of the many different types of heat transfer apparatus in which this patented surface has proved highly successful. The illustration at the left is one of more than 100 large G-Fin bundles used in Stratco Contactors in alkylation plants. The small illustration above shows the design of the Twin G-Fin Section, of which more than 40,000 are in use on a wider variety of services than any other design of heat transfer apparatus.

G-Fin elements are also applicable to vacuum or pressure condensers, baffled exchangers, preheaters, storage tank oil heaters and other types of exchangers. Before buying your next heat transfer apparatus, be sure to investigate the possibilities of a G-Fin unit.

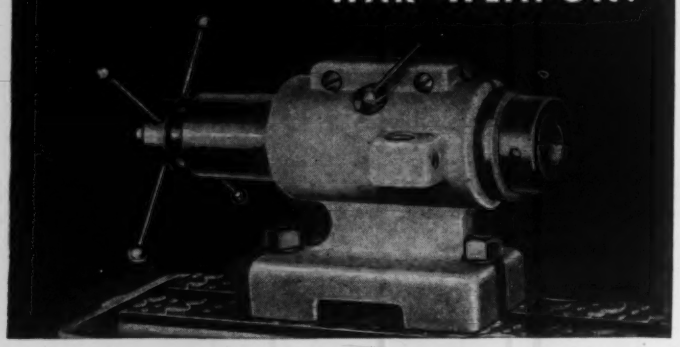
WRITE FOR BULLETIN 1625

THE GRISCOM-RUSSELL CO.
285 MADISON AVENUE, NEW YORK 17, N. Y.

GRISCOM-RUSSELL

Pioneers in Heat Transfer Apparatus

"Everybody" knows that tool steel is a WAR WEAPON!



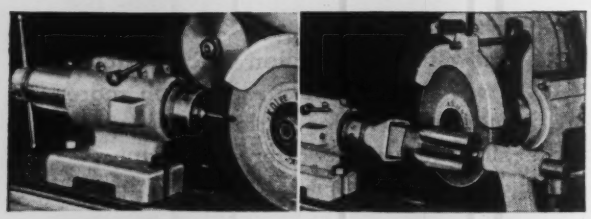
For use on any make tool grinder!

YOUR taps are made from FINE TOOL STEEL!

Maintain them with a knock-out TAP GRINDING FIXTURE!

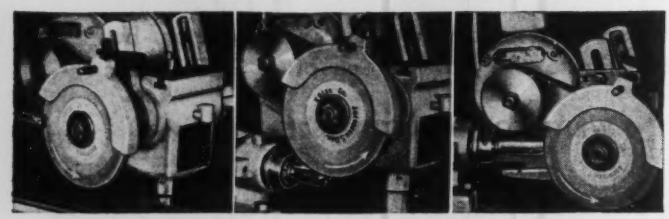
All grinding operations necessary on a tap are done with one fixture with one set-up. Taps commonly considered ready for discard now can be salvaged and returned to service.

Taps held in collets are insured against inaccurate grinding. Operators with little tool room experience soon become efficient with the new K-O TAP GRINDING FIXTURE.



Grinding the relief on a No. 10 tap

Sharpening a 2½" tap



Sharpening a Standard tap

Grinding the flutes

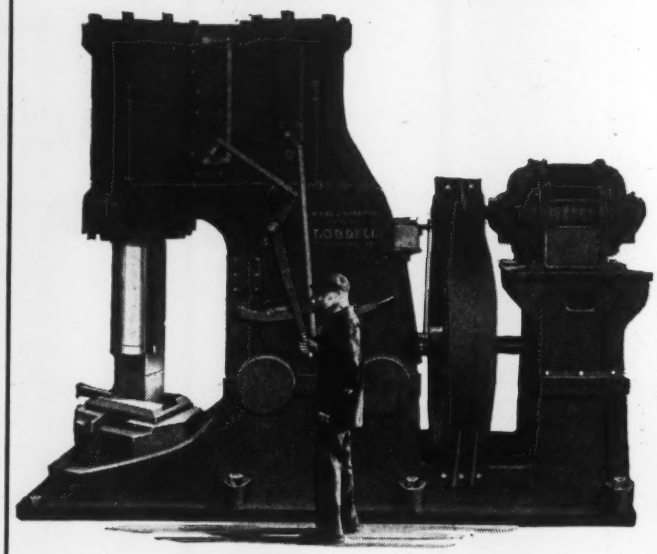
Salvaging broken tap

K.O. LEE CO.

ABERDEEN, SO. DAK.

A GIANT

FOR GENERAL FORGING



THE LOBDELL-NAZEL TYPE-S

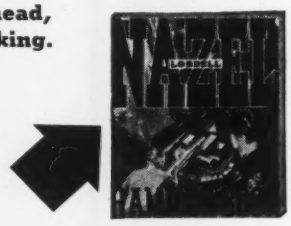
. . . is a most powerful, self-contained, motor driven forging hammer for general forging work, as well as for production forging. It is time-tested in the leading forge shops of this and foreign countries.

In addition to the rhythmic, automatic blows, characteristic of the pneumatic forging hammer, it can hit a single or set blow from any point of the stroke and at a force completely under the control of the operator.

More than ordinary clear working space above and around the anvil, as well as unlimited size of dies, is another outstanding advantage, adapting it to the widest variety of forging operations.

It is available in five sizes, suitable for the lightest forging to efficiently handling 13" x 13" billets.

Write for the "Hammer Book"— on your business letterhead, please. It is yours for the asking. Our engineering consultation is available at all times to assist you in selecting one or more LOBDELL-NAZEL hammers, to fill your exact requirements.



LOBDELL-NAZEL

The *ONLY* Self-Contained, Air Actuated Forging Hammer Performance Tested by More Than 1100 Users in Over 70 Different Industries ★

PRODUCES FORGINGS FASTER . . . BETTER . . . CHEAPER

LOBDELL COMPANY Estab. 1886 **WILMINGTON 99, DEL.**

Built and sustained upon the rights to FREE, COMPETITIVE, PRIVATE ENTERPRISE guaranteed by the Constitution of the United States

Sgt. Spring, M.E., E.E., MET.E., CH.E., etc.

WE'VE GOT HIM COVERED

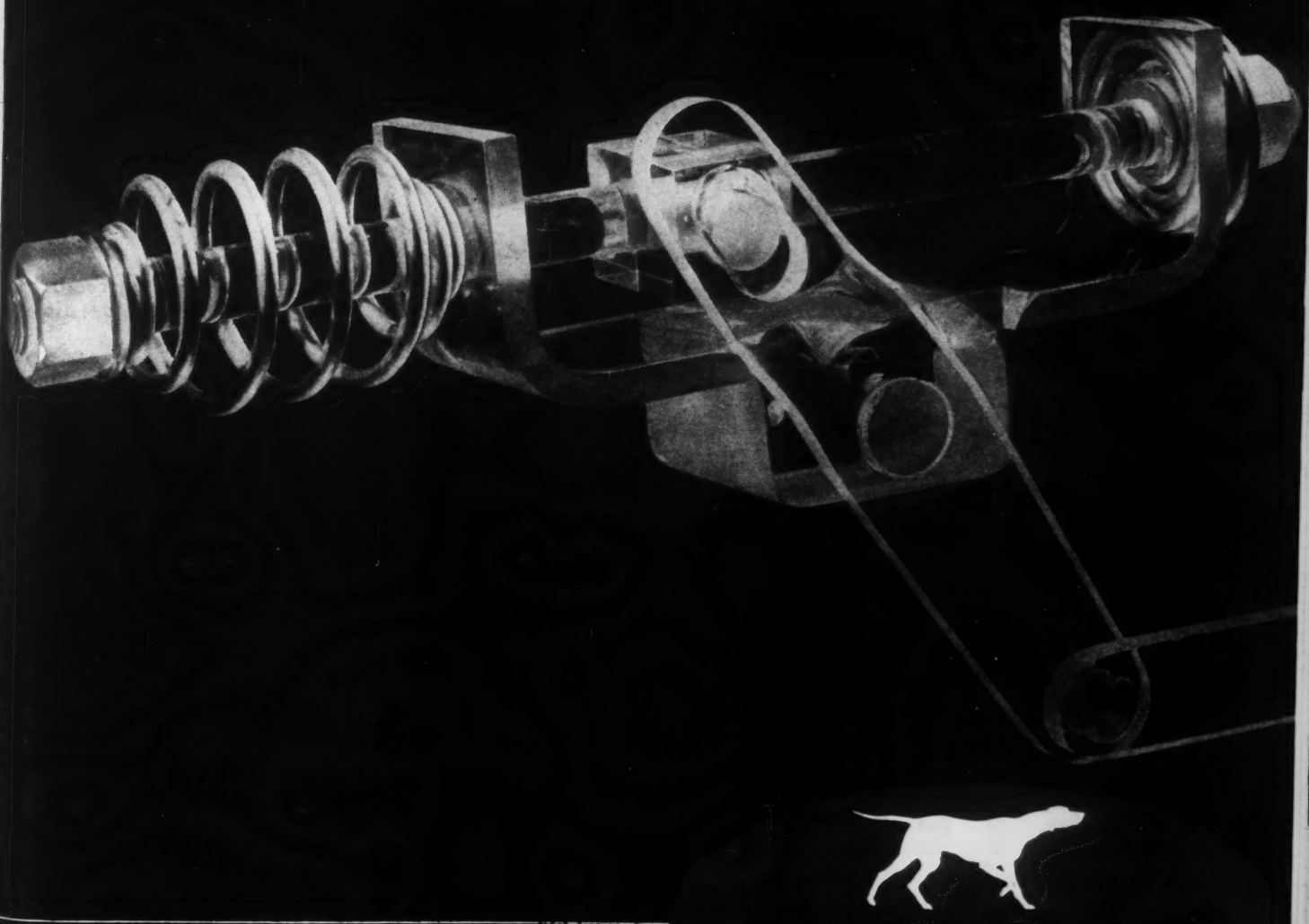
From the Hunter Data Book have sprouted many ideas for spring-operated devices that are doing their bit to finish off the Axis. This handy fact-packed book is full of information you need at your desk or drawing board. For a free copy, send your signature on your business letterhead. It will be mailed promptly.

THERE was a time, very likely within your memory—when a spring was simply a curlicue of wire. You made it. If it didn't work, you gave it another twist and tried again. This cut-and-try approach was certainly not design—and hardly economical manufacture. But it had its day . . . and that day is over.

Now, to fit a spring precisely for the job it must do in your product . . . to make it an ambassador of the quality and performance your customers expect from you, requires all the scientific knowledge a spring manufacturer can bring to bear.

The most naive-looking spring will often surrender only to the combined efforts of calculus, metallurgy and statistical control of quality. But in 99-44/100 percent of the problems, science wins out where rule-of-thumb would flop. The war has proved the case for scientific spring making. Future applications will rest on that proof.

THE BARREL SPRING—*The barrel spring is a fundamental spring form, designed to resist, or store up until wanted, a compressive force, and to compact into the minimum solid height. One of many for-instance applications for barrel springs is shown in the Plexiglas model below.*



HUNTER PRESSED STEEL COMPANY, LANSDALE, PENNA.

FOSTER REGULATION ENGINEERING

Saves Maintenance Time

for example:

1 Major overhaul, when necessary, without breaking the line

3 Guide and spring easily replaced

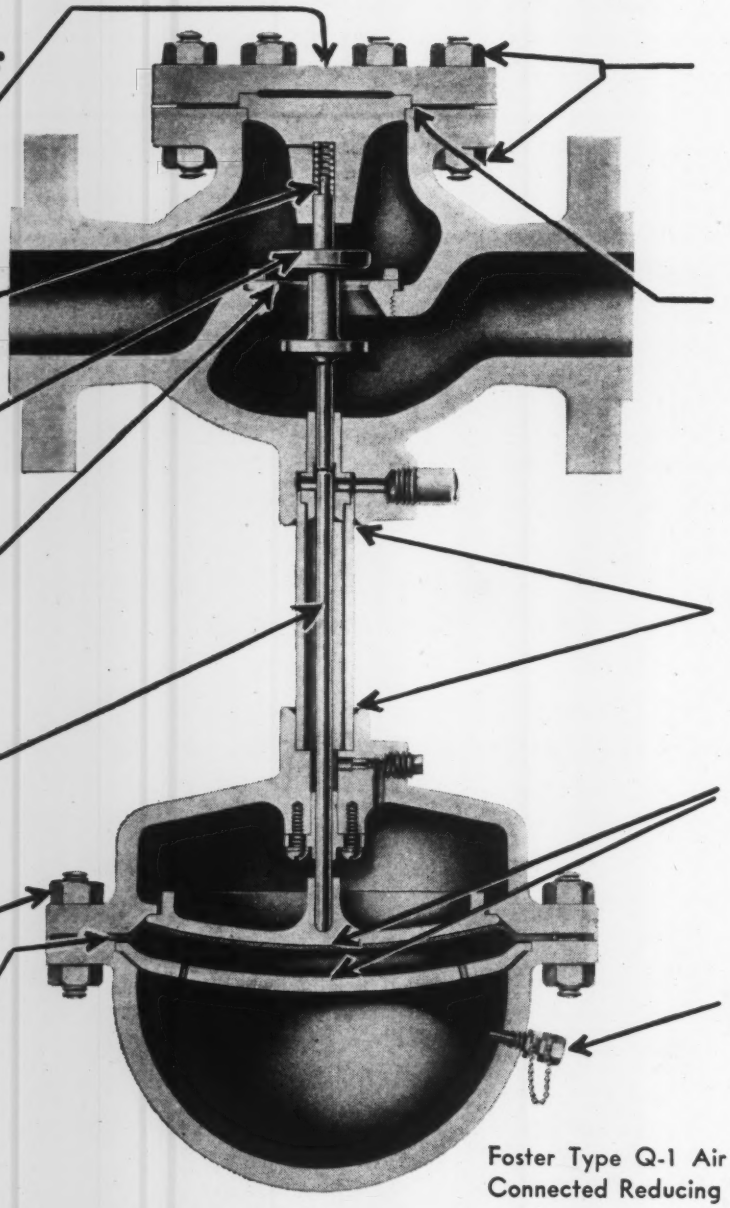
5 Main valve accessible — easily reseated

6 Main valve seat ring replaceable

7 Pushrod removed from lower end

2 All bolts are *stud* bolts — easily loosened

10 Diaphragm unit can be removed without disturbing rest of valve



2 All bolts are *stud* bolts — easily loosened

4 Ground joint — no gasket required

8 Brazed — no packing required

9 All smooth contact surfaces for diaphragm

11 Air fitting replaceable

Foster Type Q-1 Air Dome Loaded — Direct Connected Reducing Valve for Steam Service

Foster Regulation Engineering, built into each valve, is your assurance of years of accurate trouble free operation.

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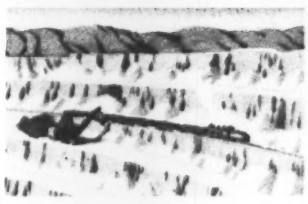
12-FE-3

REPORTING *on the use of Linde Methods in mass production . . .*



Production and Fabrication of Steel . . .

through the entire cycle from mining to scrapping, LINDE METHODS *are important*

The oxy-acetylene processes shown here—flame-cutting, flame-cleaning, flame-gouging, welding, and hard-facing—are a few of the many Linde processes that are important in the entire cycle of steel. In iron mines . . . in mills where steels are made . . . in fabricating shops . . . even in scrap yards where worn-out equipment is prepared for further service . . . Linde developments help to speed production and lower costs.

In this mine maintenance shop, for example, the equipment is kept in good operating condition by the use of some of these Linde processes. The portable oxy-acetylene cutting machine used here to reclaim a worn locomotive wheel is also used to produce steel shapes from stock steel.

There are other Linde methods to help maintain production . . . methods for hard-facing parts such as dipper teeth . . . for gouging out cracks in castings to prepare them for welded repair . . . and for flame-priming structural steel and plate to make paint last longer when it is applied.

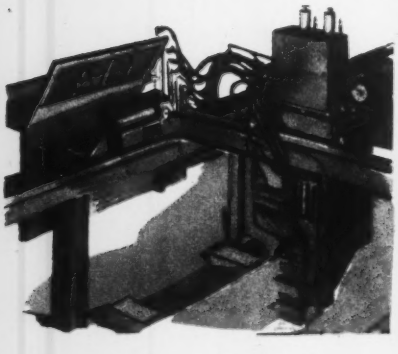
In the next three pages you can learn more about the use of Linde-developed processes in the mass-production of steel and things made of steel.

LINDE Metalworking Methods

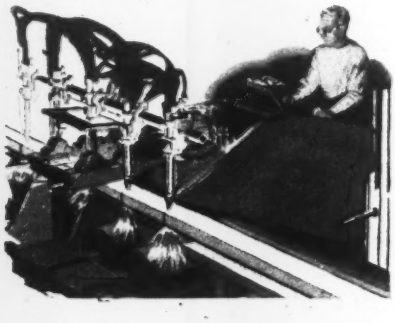
Furnace-Tapping – By use of the oxygen lance to clear the tap hole, the opening is quickly made for molten iron or steel to pour from the furnaces.

MECHANIZED HOT-SCARFING – The removal of surface defects from semi-finished steel once entailed removing the hot steel from the production line . . . allowing it to cool . . . treating it to make defects visible . . . or chipping out these defects . . . and then reheating the steel for further processing. Today, through use of Linde equipment, mechanized batteries of oxy-acetylene blowpipes located on the roll tables literally "skin" faulty surfaces from the hot steel . . . and higher yields of quality steel are obtained without interruption of production.

Deseaming – Where mechanized conditioning of steel is not feasible, or for secondary conditioning, Linde's manually operated flame - scarfing equipment is used.



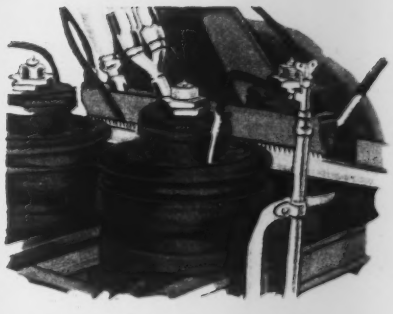
Mechanized Cold-Scarfing –Some special steels, such as slabs of armor plate, are allowed to cool before scarfing by Linde machines that move along the slab.



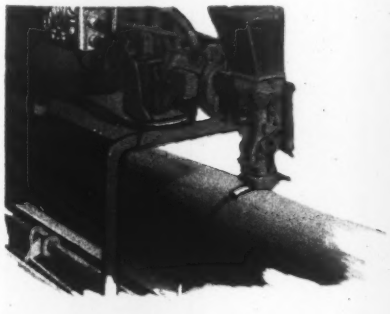
Billet-Cutting – Flame-cutting machines developed by Linde are used in the production line to cut billets and bars to length quickly, several pieces at a time.

. . . Save Time and Materials

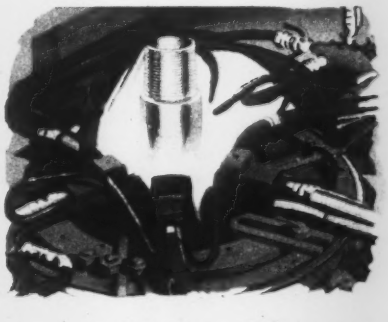
MECHANIZED FLAME-CUTTING — For shaping steel in the fabrication of industrial machines and equipment oxy-acetylene cutting is effecting important savings, both in time and in materials. The oxy-acetylene flame quickly and accurately slices through steel in straight lines, circles, or irregular shapes . . . work that otherwise would require massive machines. Linde engineering skill has helped adapt this "knife that never dulls" to high-speed work like the flame-planing of ship steel shown here. In one operation plate edges are trimmed to exact size and beveled like this ⋈ for welding.



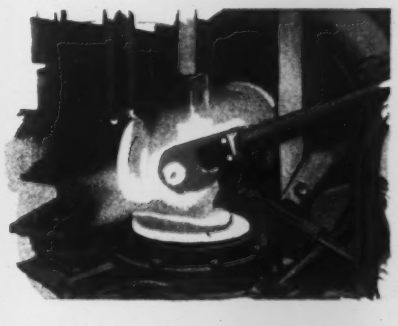
Tube-Welding—In making welded tubing, edges of steel strip moving at high speeds through forming rolls are joined by oxy-acetylene flames.



Unionmelt Welding—Linde's automatic electric welding process makes high-quality welds in steel of any thickness at unusually high speeds.



Flame-Hardening — Oxy-acetylene flames, followed by a water quench, impart a hard, wear-resistant case to surfaces of carbon or alloy steel parts.



Flame-Spinning — Tubing heated by oxy-acetylene flames while spun rapidly can be quickly end-formed to eliminate deep-drawing operations.

LINDE METHODS help to complete the cycle of steel and things made of steel

On the three preceding pages you have seen how Linde-developed processes and equipment speed the production of steel and things made of steel . . . from the mining of ore through all phases of fabrication. When steel products have served their useful life, oxy-acetylene processes help to complete the steel cycle. Flame-cutting with manually operated blowpipes is a fast and economical way to reduce steel to pieces of the right size for charging into furnaces for the production of new steel. During this work, many usable parts and steel sections can be salvaged for reclamation by welding and put back into service.

In whatever way you may work with steel it is likely that Linde engineering skill can help you adapt the oxy-acetylene flame to your operations.

The folders shown at the left tell the story of the use of Linde methods in SHIPBUILDING, in STEELMAKING, in METAL-FABRICATING, and in the production of PIPE. Copies will be sent to you upon request. Ask for Combination "B".

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How to Prepare for MORE WORKERS ...and keep them

INLAND RUBBER CORPORATION BROKE A PRODUCTION BOTTLENECK WITH *MODERN VENTILATION*

Eight months ago, Inland Rubber Corporation of Chicago broke the bottleneck in their tire repair material department with this simple installation of Propellair ventilating equipment.

Demand for Inland vulcanizing sections—vital to the daily operation of American and Allied combat vehicles—was soaring, but there was no space for expansion. Fumes and haze from hot presses and from the buffing and cementing operations made working conditions unpleasant, labor turnover high. Ventilation was the obvious need. But *how?* Low ceilings prevented elaborate duct work.

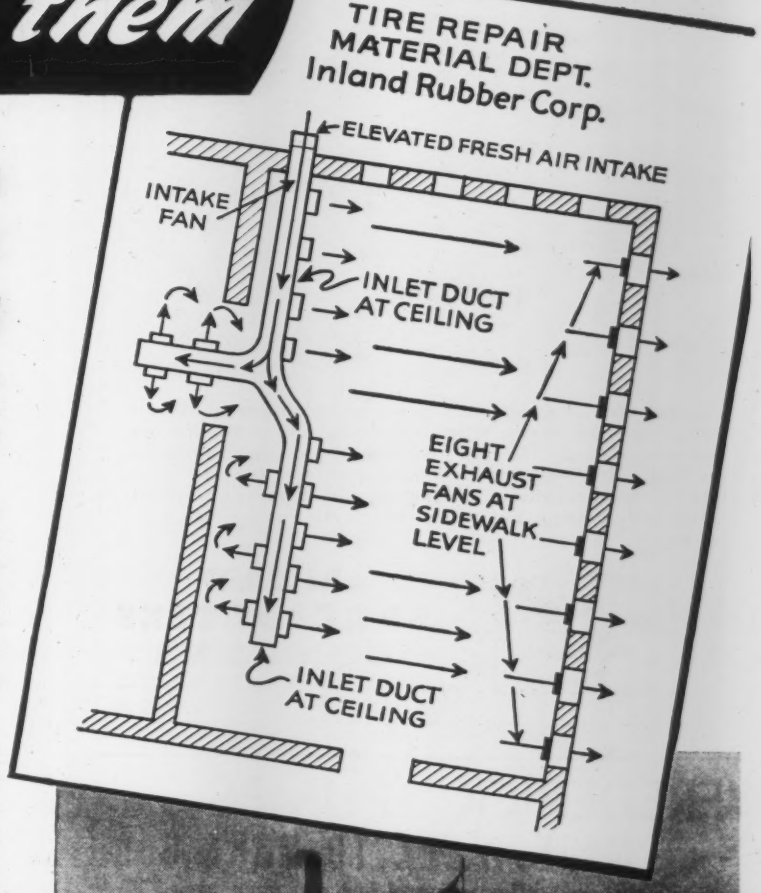
Transforming this area into a comfortable environment for *two and one-half times* the number of previous employees was not at all difficult for Propellair engineers. A single duct with an elevated outside intake now introduces fresh air at several points along one inside wall, and all or any of eight exhaust fans in street-level windows complete the ventilating circuit by drawing air across the room.

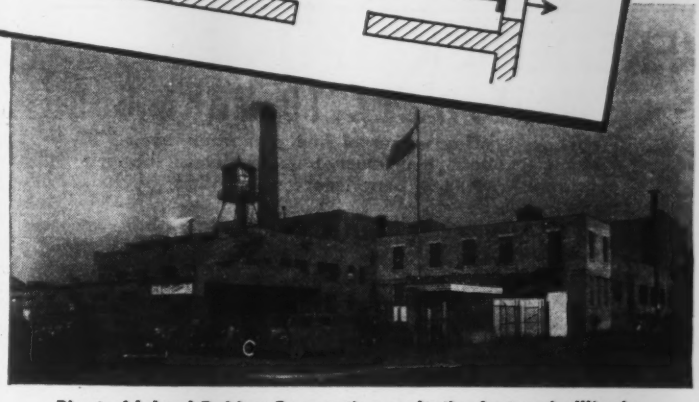
Higher Morale, Immediately

Inland workers responded immediately. Morale and output rose in these comfortable, healthful surroundings, and Inland management is highly pleased that Propellair ventilation enabled them to step up production without physical expansion. Only once has the system been down—due to electricity failure—and when started again it cleared the air in less than three minutes.

There are other Propellair installations at the Inland plant, but none can better demonstrate the benefits of modern industrial ventilation or the advantages of compact Propellair design, which in this case, as usual, takes up no working space at all.

Let Propellair engineers show you how simply and easily you can apply these high-capacity, low-horsepower, airfoil-propeller fans in your present and prospective operations. Send for Catalog No. 10. There are Propellair distributors in 25 principal cities.





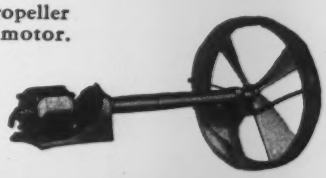
Plant of Inland Rubber Corporation, only tire factory in Illinois.

THESE ARE THE FANS . . .

Like all Propellair fans, those at Inland Rubber Corporation are of the axial-flow type with highly efficient airfoil-section blades and airfoil-principle curved entrance rings. This modern equipment delivers maximum air volume from minimum horsepower; permits easy, simple installation; requires little space. These two types are used in the Tire Repair Material Department:

Exhaust Fans: 30"-diam., 2-blade propeller equipped with ¼-H.P., 1750-r.p.m. motor. Type CD-30D.

Intake Fan: 24"-diam., 4-blade propeller with shaft extended to locate 2-H.P., 1750-r.p.m. motor outside airstream. Model CE-24M.



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FLAT TOP WORK HOLDER
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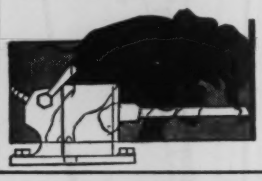
This new type of air-operated fixture for holding small flatwork for toolroom use or production operations solves a troublesome problem. Mead "Flat Top" holds any work which is flat on the bottom, regardless of peripheral contour. Assures "dead true" perpendicularity for drilling, reaming, tapping operations. Completely described in the new Mead Air Power Catalog . . . just out.



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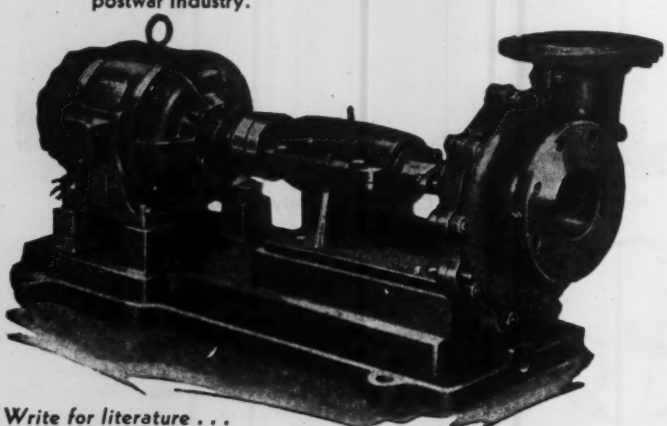

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THE *Frederick* IRON & STEEL CO.
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Over 25 years' experience in the making of fine pumps

Pick your own!

THE ALL-METALLIC construction of the one-unit, self-contained An-cor-lox lock nut (patented) is standard in varied types to suit individual service requirements . . . for lock nut strength, resistance to corrosion, or high working temperatures, etc. Our engineers will gladly make recommendations.

¶ *Note:* Bolt stretch, wear, or any loosening of bolt assembly, does not affect the locking grip of An-cor-lox. Our An-cor-lox bulletin tells all about it. Of interest to every production executive! Write for your copy—and An-cor-lox sample.

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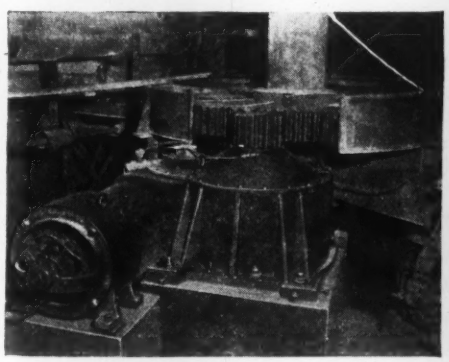
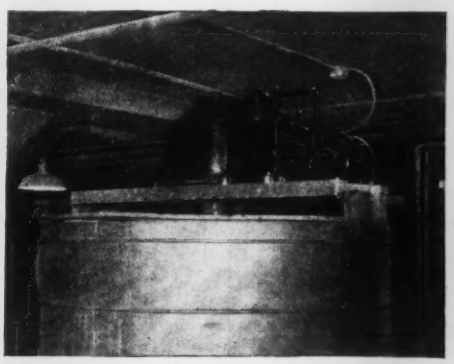
-for Vertical Shaft Drives

THESE machines fill a long felt need for double reduction units of the fully enclosed type to be used for agitators, mixers, ore roasters, bending rolls, etc., requiring a vertical shaft drive. Built in standard ratios in various types of assemblies ranging from 40 to 1 to 250 to 1 for all common motor speeds and a wide range of horsepower ratings.

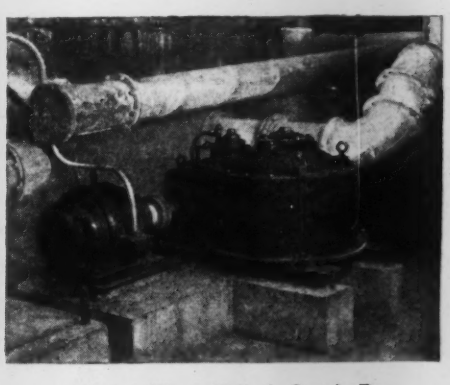
Jones Bulletin No. 75 covers complete details on these Worm-Helical Speed Reducers, with rating tables, dimension diagrams, torque charts and other application information. We shall be pleased to send you a copy.



• Jones Worm-Helical Speed Reducer on ore roaster with section of dust guard removed to show final gear reduction.



• Jones Worm-Helical Speed Reducer driving a lacquer agitator. A simple design prevents leakage of oil along the vertical low speed shaft.



• Jones Worm-Helical Speed Reducer on a paper mill agitator drive.

W. A. JONES FOUNDRY & MACHINE CO., 4427 Roosevelt Road, Chicago 24, Illinois

For strength and simplicity, only two parts are used — bearing bars which carry the load and have curved slots punched ABOVE THE NEUTRAL AXIS, and cross bars, of the same cross sectional area as the slot itself, pressed into these slots to distribute the load. No rivets, bolts or welds are required, thus eliminating the possibility of loose joints. Tri-Lok flooring comes in rectangular, diagonal and U shapes with Safety Steps — ask for Bulletin 1140 — DRAVO CORPORATION, NATIONAL DEPARTMENT, 300 Penn Avenue, Pittsburgh (22), Pa. (Distributor for THE TRI-LOK COMPANY).

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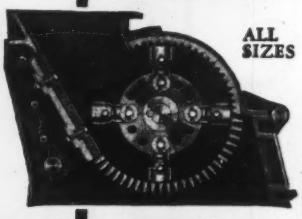

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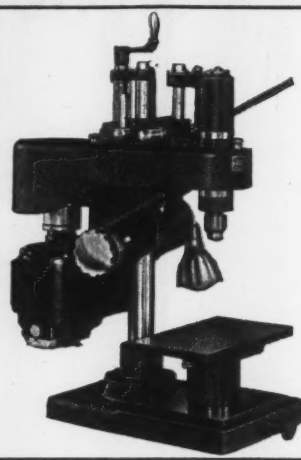

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The HAMILTON MUEHLMATT
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THE HAMILTON TOOL CO.
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TRICK SHAPE FOR A TO TAKE

★ *It's easy, though not economical, to forge a piece of solid metal to the external shape of a tee like this, and then bore the run and branch. But to start with a seamless tube, form the long outlet, and at the same time maintain full wall thickness and adequate reinforcement, is quite a different matter.*

Taylor Forge tackled this problem a good many years ago and made the first seamless welding tees having outlets of ample length. The methods for doing this production job can also be used to make unusually long outlet tees such as the "special" pictured here. We have never seen another like it. Have you?

ACROSS the years, when the question has been, "Who can handle this difficult forging requirement?", industry's verdict has almost invariably been Taylor Forge. It is a verdict based on a great and ever-growing volume of evidence, just a few examples of which are being cited here.

This recognized "know-how"—this conceded knowledge of how to control hot metal under pressure and impact—has a highly important bearing on our standard line of WeldELLS, tees and other Taylor Forge Welding Fittings.

It is this broad knowledge, and the special processes springing from it, that enable us to give you so many *extra* features in WeldELLS and other Taylor Forge Welding Fittings. It explains why we can control the distribution of metal—place extra metal where stresses are greatest. It explains the extreme accuracy of dimensions . . . the absolute uniformity. It explains why WeldELLS have the features listed opposite . . . why, in fact

WeldELLS *have everything*

WeldELLS alone
combine these features:

- **Seamless** — greater strength and uniformity.
- **Tangents**—keep weld away from zone of highest stress—simplify lining up.
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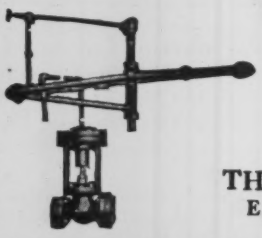

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Send for Circular H-12

THE C. E. SQUIRES CO.
E. 40th St. and Kelley Ave.
Cleveland, Ohio

SMALL Folding WIRE TERMINALS
With or Without Insulation Grip—Small or Large Screw Hole
For Standard, Extra Flexible Stranding and Solid Wire

★ WRITE FOR BULLETIN 8-D ★

K E H KRUEGER & HUDEPOHL
WALSH BUILDING · CINCINNATI, OHIO

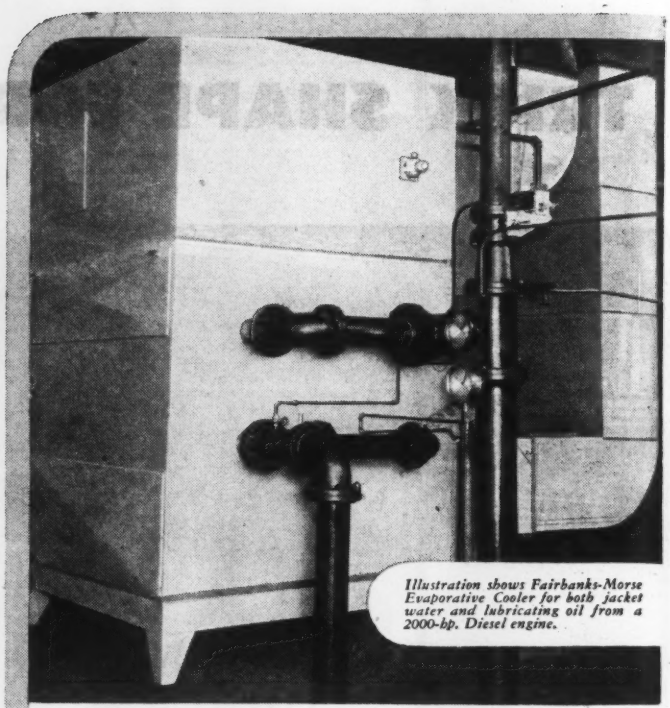


Illustration shows Fairbanks-Morse Evaporative Cooler for both jacket water and lubricating oil from a 2000-hp. Diesel engine.

PLAY SAFE!

Improve Your Engine Cooling System with a FAIRBANKS-MORSE Evaporative Cooler

Don't take unnecessary chances on costly shut-downs!

Investigate—then install—Fairbanks-Morse Evaporative Coolers on your Diesel and gas engines. They assure you longer engine life, fewer shut-downs, less repairs—more economical over-all performance and protection.

Fairbanks-Morse Evaporative Coolers save water—using actually only 5% of the amount generally required for a continuous water supply.

Write for complete information to Fairbanks-Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

BUY WAR BONDS

FAIRBANKS-MORSE
DIESEL ENGINES · PUMPS · MOTORS · GENERATORS · WATER SYSTEMS · SCALES · STOKERS · FARM EQUIPMENT · RAILROAD EQUIPMENT
Diesel Engine Cooling Equipment

The HEAVY HAND *with a DEFT TOUCH*

Straightedging a heavy forging to locate deflection. The traveling table speeds this operation just as it does placing, removal, and straightening.

STRAIGHTENING PRESS MODEL No. 5990
Capacity 660 tons. All steel, self-contained, with long bed and power-traveling table.

BIG FORGINGS "GO STRAIGHT" IN A HURRY WHEN THIS ELMES PUTS ON THE PRESSURE

Bars, quill shafts, piston rods, and other forgings too numerous to list, come from annealing furnaces to this 660-ton, all-steel Elmes straightening press at Plant No. 1 of A. Finkl & Sons Co., Chicago, nationally known for quality forgings.

Sizes range up to 12-in. diameter, yet the Elmes press with its 17-ft. long bed and traveling table can be served conveniently at either end from above, and Elmes positive hydraulic pressure under accurate control can be applied in just the right amounts and at just the right places to remove heat-treatment distortion surely and quickly.

TRAVELING TABLE SAVES TIME

The independently powered traveling table is equipped with heavy adjustable V-blocks and with air-actuated roller lifts which enable the operator to revolve the part easily both for visual inspection and for straightening to forging tolerances. Fine precision is unnecessary here, but minor changes in control can adapt the press for extremely exacting service.

A. R. Lane, Works Manager, says they have had no trouble whatever, and that during the two and one-half years this straightening press has been on the job it has done good work quickly and dependably. A. Finkl & Sons Co. is now exclusively on war production, a large part for the Navy, but in normal times their four Chicago plants are kept busy producing a general run of die blocks and other heavy forgings.

You too can put your pressing problems up to Elmes. Nearly a century of specialization is your assurance of expert recommendations and performance at its best. Elmes Engineering Works of American Steel Foundries, 239 N. Morgan St., Chicago 7. Also manufactured in Canada.

WHAT TYPE OF PRESS SHOULD YOU HAVE?

Elmes hydraulic presses serve modern industry in many ways, in many places. Forcing, forming, die sinking, extruding, straightening, bending, plastics molding, and many other operations are routine on Elmes presses because Elmes equipment is thoroughly dependable and Elmes simplified controls are fast, accurate, instantly responsive.

Standard designs include the full range of types and sizes, yet development of special arrangements or adaptations constitutes an important part of Elmes engineering service. Write today for literature on the type of press you need, or for suggestions on how best to apply hydraulic force to cut production costs. Let Elmes experience be your guide in planning for tomorrow.

ELMES HYDRAULIC EQUIPMENT

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES EXTRUSION PRESSES PUMPS ACCUMULATORS VALVES ACCESSORIES

When You're Cramped for Space

USE THESE VERY LIGHT INCH SERIES BEARINGS

HAVING bores abnormally large, as compared with the outside diameter, they offer the engineer such important advantages as *compactness, light weight and greater latitude in design.*

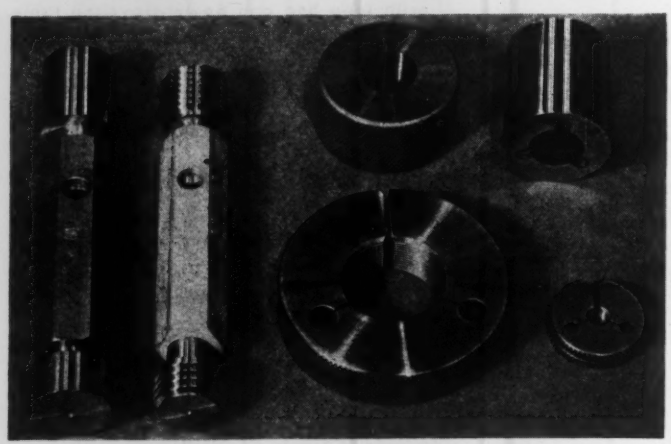
They are available in ball bearing sizes from 1/8" to 21" bore, and in roller bearing sizes from 1½" to 21" bore.

Write for the Catalog. Let our engineers work with you.

"NORMA-HOFFMANN"

PRECISION BALL, ROLLER AND THRUST BEARINGS

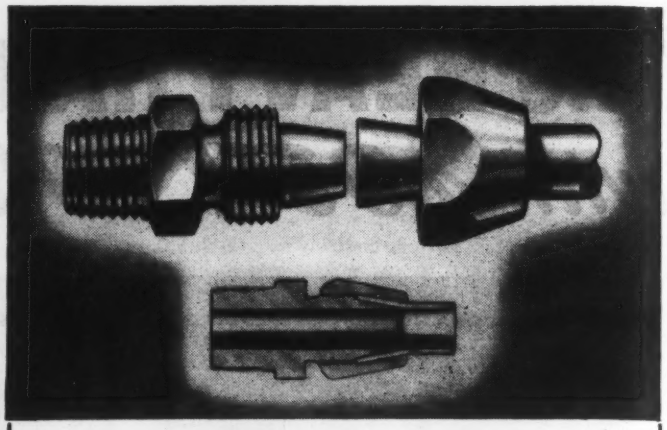
NORMA-HOFFMANN BEARINGS CORP'N —STAMFORD, CONN., U. S. A.



Prompt Shipment OF MERZ STANDARD GAGES

● As one of the four divisions of Merz service to industry, a large stock of standard, plain and threaded, plug and ring gages is maintained at all times for prompt shipment. Special gages, tools and fixtures are made to order; a complete experimental and research engineering service is available; and manufacturing of precision products on contract is done in one of the best-equipped plants in this area. Ask for literature "4 Spheres of Service," just off the press.

MERZ *Engineering Company*
INDIANAPOLIS 7, INDIANA



SUPERSEAL Flared Tube Fittings

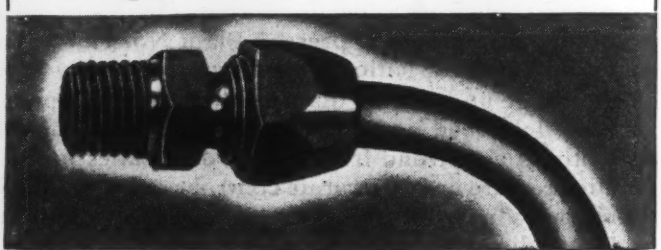
Can be disconnected and reconnected repeatedly without injuring fitting or tubing

Advantages of Superseal Fittings include:

1. Long 10° tapered cone provides greater seating area for tubing flare . . . assuring a leakproof joint even under maximum vibration and pressures.

2. When the nut is tightened, there is no shearing action to injure the tubing at the point of flare–instead the tubing is actually strengthened.

3. Tubing can be easily flared to SUPERSEAL'S 10° angle.



4. Inside diameter of tubing is uniformly maintained . . . no obstructions at joint.

5. Tubing bends can be made close to the fitting.

6. Adapted to welded, brazed or seamless steel tubing . . . and all non-ferrous tubing.

7. Sizes ½" OD and smaller of Steel; sizes ⅝" OD and larger of Malleable Iron.

8. Used on oil, gas, chemical and other lines.

Write for Catalog 2-R, "Grinnell SUPERSEAL Flared Tube Fittings".

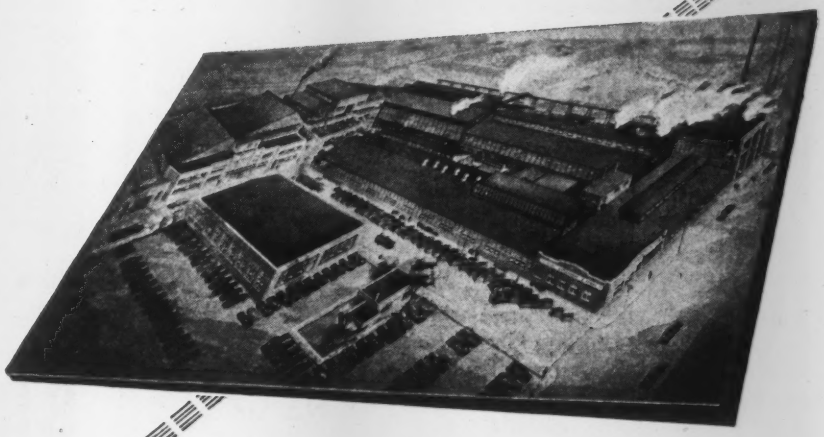
GRINNELL COMPANY, INC.
Superseal Division, Providence 1, R. I.

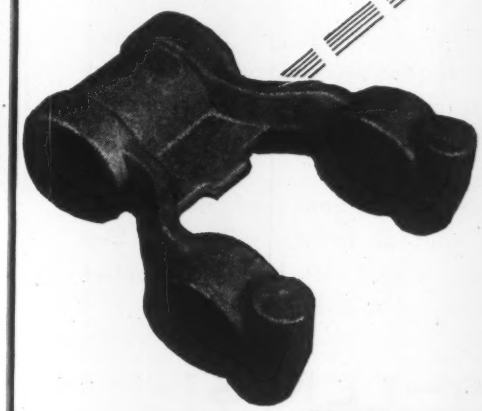
GRINNELL

WHENEVER *Piping* IS INVOLVED

One purpose • • •

the IMPROVEMENT of Metals





Continuous fibre flow throughout the structure of this unit is essential to provide the physical properties necessary to meet exacting service requirements.

by Forging

In forging the design of a part is usually a governing factor in developing the metal quality required to meet a given service condition. Designing especially for forging makes possible the utmost IMPROVEMENT OF METALS BY FORGING. The more simple, straightforward designs often permit a high rate of production. Throughout 31 years of forging production experience, our engineers have employed all the known forging techniques to forge many so-called impossible-to-forge designs. Ask one of our forging engineers about how to improve product performance with forgings.

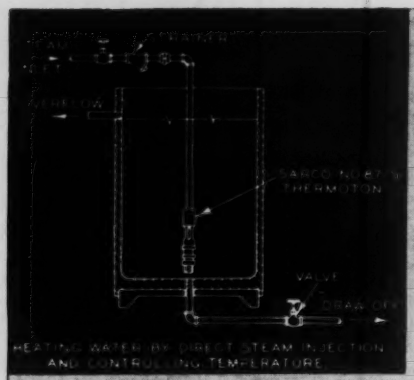
Reference Data Booklet presents many new ideas on forgings and their applications in many different kinds of equipment. Copies available to engineers, metallurgists and executives.

DROP

THE STEEL IMPROVEMENT & FORGE CO.

FORGINGS

952 East 64th Street CLEVELAND, OHIO



WATER HEATER *and* TEMPERATURE CONTROL IN ONE

Sarco type 87-S Thermoton combines a silent steam injector with automatic temperature control in one inexpensive unit, easy to install.

Suitable for cleaning or rinsing tanks in metal finishing shops or wherever small quantities of water are heated by direct steam injection. Ask for Catalog No. 550.

No. 87-S

SARCO SAVES STEAM

SARCO COMPANY, INC.
475 Fifth Avenue, New York 17, N. Y.
SARCO CANADA, LTD., 85 Richmond St. W. TORONTO, ONT.

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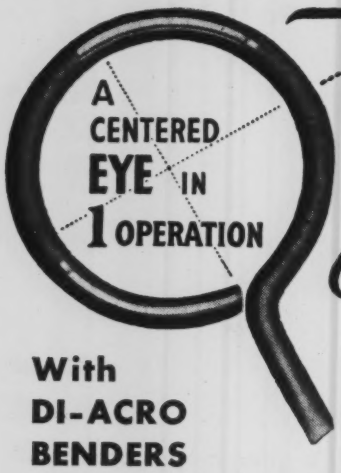


Precision CENTERED EYE *Bending*

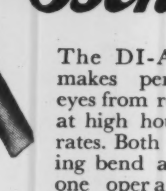
With DI-ACRO BENDERS

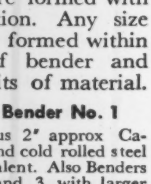
DI-ACRO Precision Bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at high hourly production rates. Both eye and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

DI-ACRO Bender No. 1

Forming radius 2" approx Capacity $\frac{1}{32}$" round cold rolled steel bar or equivalent. Also Benders No. 2 and 3 with larger capacities





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"DIE-LESS" DUPLICATING showing many kinds of "Die-less" duplicating produced with DI-ACRO Benders, Brakes and Shears.

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

← Pronounced "DIE-ACK-RO"

O'NEIL-IRWIN MFG. CO.

308 EIGHTH AVE., SOUTH • MINNEAPOLIS 15, MINN.

To us, . . . just another

BRONZE CASTING

The above illustration is the needle casting for an 84" Balanced Needle Valve,—made of manganese bronze, chill cast. It is machined all over and requires a perfect surface. The destination of these valves was Madden Dam in the Canal Zone. The Reclamation Service Dams and other large water supplies have valves of this type of various sizes largely made of manganese bronze. The requirements are—corrosion resistance, permanency of construction, the strength of steel, and hydraulic pressure tightness.

There are many conditions and requirements where *some* kind of bronze will serve best. There are many kinds, each having its applications. Consult us on your design problems.

HY-TEN-SIL
A Bronze as Strong as Nickel Steel

CASTINGS . . FORGINGS . . HOT ROLLED RODS

Specifications Castings: Army & Federal—QQB-726-B & C: Navy—46B-29

Specifications Rolled Rods & Forgings: Army & Federal—QQ-B-721 B: Navy—46B 15d-B

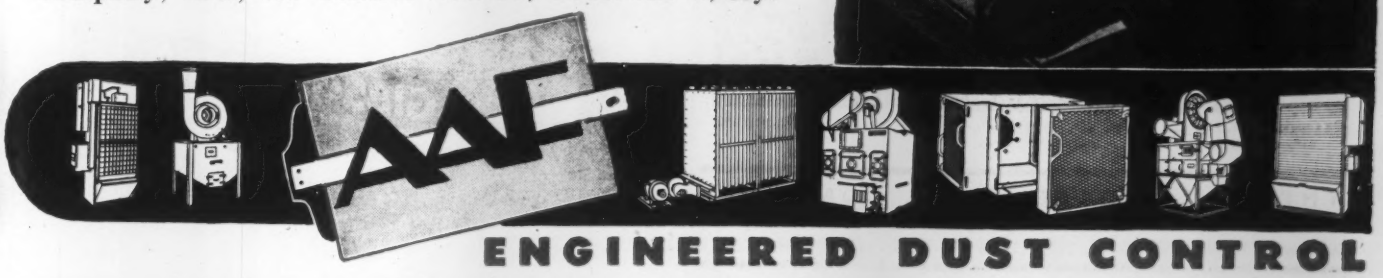
AMERICAN MANGANESE BRONZE COMPANY

4703 Rhawn St. Holmesburg, Philadelphia 36, Penna.

NEW YORK CITY • PITTSBURGH, PA.
35 YEARS' EXPERIENCE

Here's Your Answer!

REGARDLESS of the quality and serviceability of the filters used in your air cleaning system — their dust collecting efficiency will depend upon their suitability to the particular service and the manner in which they are applied and installed. To guide you in selecting the RIGHT filter and installing it correctly, we have prepared this helpful booklet. It's FREE for the asking — without obligation — Write American Air Filter Company, Inc., 103 Central Avenue, Louisville 8, Ky.



ENGINEERED DUST CONTROL

The RIGHT FLUX for the JOB

No. 2 FLUXINE for brazing and bronze welding—copper, copper alloys, malleable iron and steel.

No. 6 FLUXINE . . . non-glaring . . . for bronze bonding—cast and gray iron with bronze and nickel alloy rods.

No. 7 FLUXINE for welding all types of aluminum.

No. 18 FLUXINE for gas and atomic hydrogen welding of stainless steels and inconel.

No. 41 FLUXINE used with high-melting silver solders on copper and its alloys and on steel.

No. 42 FLUXINE used with Westinghouse Phos-Copper rods and low-melting silver solders on copper and its alloys.

No. 43 FLUXINE . . . non-glaring . . . used whenever low-melting silver solders are specified. No injurious fumes.

Wherever a flux is required "FLUXINE" Flux will do it better and more economically. Write us today for sample. Address Dept. C.

Better jobbers everywhere carry the "FLUXINE" line.

KREMBS & COMPANY
Est. 1875
669 West Ohio Street, Chicago 10, Ill.

FLUXINE
TRADE MARK REGISTERED U. S. PAT. OFF.

Carey HEAT INSULATIONS

Careytel Insulations
For temperatures up to 500° F.

85% Magnesia
For High and Medium Pressure.

Cut Production Costs

Modern industrial plants are saving thousands of fuel dollars each year through the correct application of CAREY Heat Insulations . . . a complete line of high efficiency insulating materials of Asbestos and Magnesia for every known service condition—for temperatures ranging from

SUB-ZERO to 2500° F.

Put your special problems up to Carey Engineers . . . their experience and Carey research facilities are available through branch offices covering the nation. Write for book of interesting, technical data. Address Dept. 63.

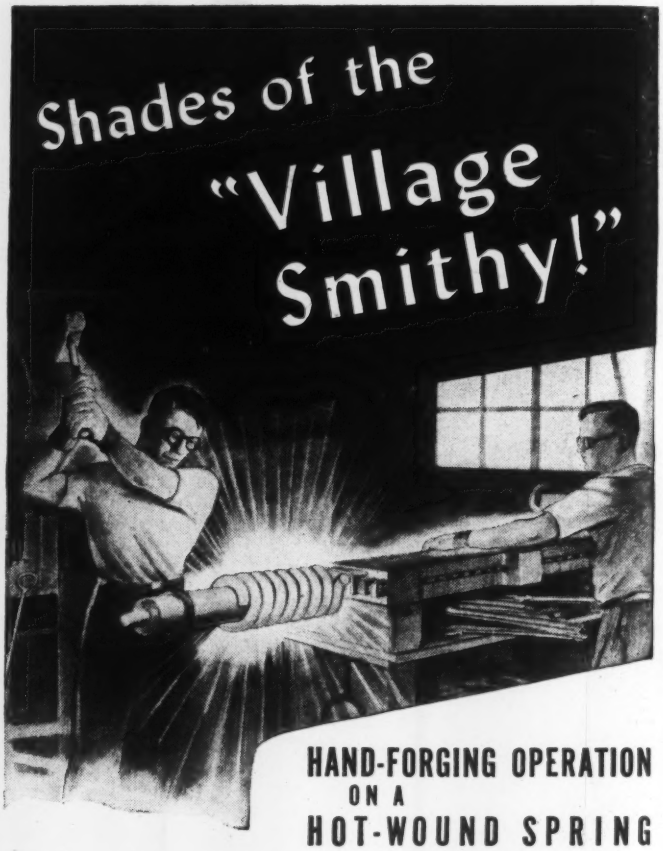
Combination Hi-Temp—85% Magnesia.

Hi-Temp Blocks—For Furnaces, Ovens, Kilns, etc.

Hair Felt Insulation
For sub-zero.

THE PHILIP CAREY MFG. COMPANY
Dependable Products Since 1873 • Lockland, CINCINNATI, OHIO
In Canada: The Philip Carey Co., Ltd., Office and Factory, Lennoxville, P. Q.

Shades of the "Village Smithy!"

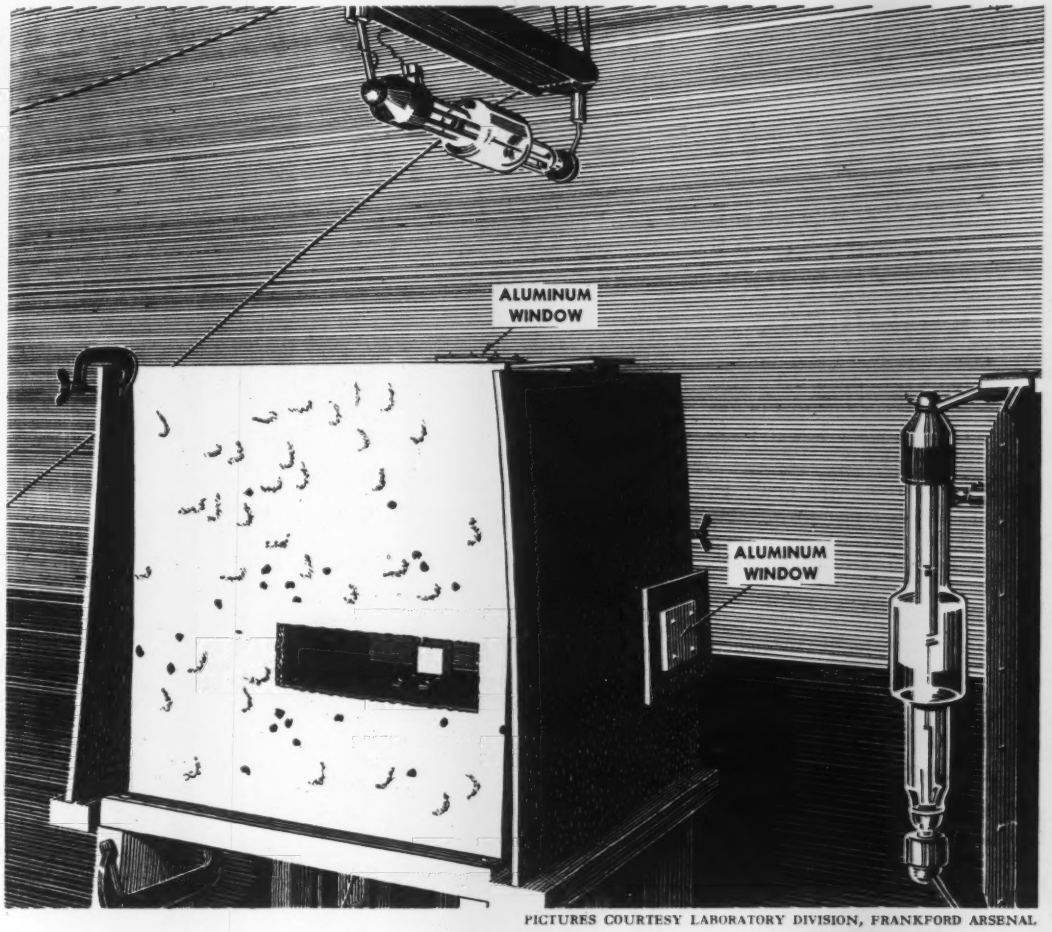


HAND-FORGING OPERATION ON A HOT-WOUND SPRING

CALL IT OLD . . call it new . . it's still the same craftsmanship instinct that knows how to coil hot bars and rods . . utilizing modern mechanical methods to the fullest, yet often relying on manual dexterity for ease of manufacture. Contrast this weighty work with fine spring wire or flat steel, fed through high-speed automatic machines, delicately adjusted to precision limits. This is the spring business—as practiced at Gibson's—so versatile that any force desired can be translated into shapes of resilient energy, controlled power. Long years have been spent investigating spring behavior under all conditions—yet this knowledge is available to you instantly—by consulting Gibson engineers when you need springs.

The William D. Gibson Company

DIVISION OF ASSOCIATED SPRING CORPORATION
1800 Clybourn Ave., Chicago 14, Illinois



PICTURES COURTESY LABORATORY DIVISION, FRANKFORD ARSENAL

High-speed X-ray picture of cal. .30 bullet penetrating 1/2 inch thick armor

High-speed X-ray picture of same bullet 20 millionths of a second later

14,285 times quicker than a wink

KEEPING UP WITH *Electricity*

MAN-MADE HURRICANE BLOWS OUT ELECTRICITY. Engineers can now "blow out" electricity as easily as you extinguish the flame from your cigarette lighter. Circuit breakers built by Westinghouse unleash a 600-mile-an-hour blast of compressed air to snuff out powerful short-circuit arcs and prevent damage to vital electrical equipment on power lines. The hurricane of air can smother a 1,000,000-kilowatt electric arc in less than a hundredth of a second.

REPRESENTATIVES OF 257 PRE-WAR PROFESSIONS, businesses, and trades are now employed at the Westinghouse operated Naval Gun Plant at Louisville, Kentucky. Included are: former circus performers, several embalmers, a former professional hill-billy musician, and a pipe-organ builder. Despite their unusual peace-time occupations, all here have been able to learn the amazing high precision needed in making Naval guns.

A NEW GUNSIGHT LAMP that enables American gunners to aim *directly into the sun* and yet fire with deadly accuracy has been developed for the Army and Navy by Westinghouse Lamp Engineers. Former gunsight lamps allowed gunners to aim within only 15 degrees of the sun, leaving a dreaded "blind spot."

FREE . . . "Engineering Highlights of 1944"—a 32 page book, filled with interesting articles on new developments in electrical research and engineering in wartime. Write: Westinghouse Engineer (ME-124).

Westinghouse research engineers have developed an ultra-high speed X-ray tube that makes possible X-ray pictures, taken at the terrific speed of *one-millionth of a second.* These pictures show armor-piercing bullets penetrating ½ inch of solid steel armor plate.

The action is 10,000 times faster than any conventional X-ray—literally 14,285 times *quicker than a wink!*

Secret of this revolutionary X-ray is the new type tube that can handle a jolt of 2000 amperes, at 300,000 volts. This is applied in a flash by electrostatic condensers—creating a tremendous surge of *X-radiation.*

With this new X-ray, U.S. Army ballistic experts can "freeze" the image of a bullet, while it travels within a gun barrel at 2600 feet per second—or study the action of projectiles as they smash through armor plate.

When peace returns, this new example of Westinghouse *skill in research* will enable machine builders to study the strains in rapidly moving parts—improve performance and increase the life of peacetime products.

Westinghouse Electric & Manufacturing Company, Pittsburgh 30, Pennsylvania.

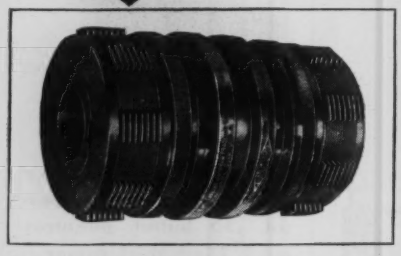
Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

TUNE IN: John Charles Thomas, *Sunday 2:30, EWT, NBC*
Ted Malone, *Mon. Wed. Fri., 10:15 pm, EWT, Blue Network*

DISCS RIDE FREE IN NEUTRAL

MAXITORQ



HAS WON THE APPROVAL OF MACHINE TOOL BUILDERS . . .

because it has the modern features necessary for smooth engagement of the clutch, quick power pick-up, quiet, cool running and positive disengagement.

MAXITORQ FLOATING DISCS ride free in neutral, kept apart by Separator Springs which permit you to "see between them". No drag, abrasion or heat. **NO TOOLS** are required either for assembly, take apart or adjustment of spring tension. **ENGAGEMENT** is easily controlled with light pressure.

DISCS are in exact duplication of thickness, no low or high spots. Contact evenly distributed for longer life . . . better performance.

Both single and double styles are available in wet or dry types . . . ¼ to 5 H.P. at 100 R.P.M. Also made in Pulley and Cut-off Coupling types.

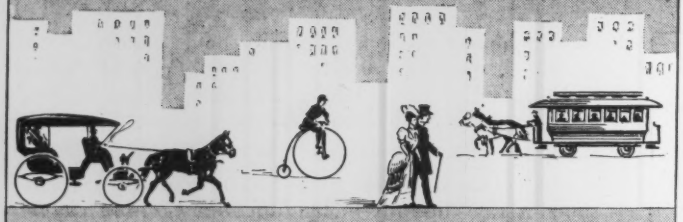
SEND FOR CATALOG NO. 4

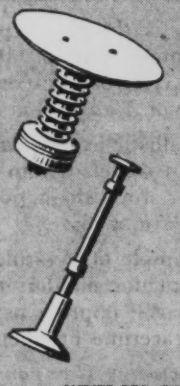
MAXITORQ *floating* **DISC CLUTCH**

THE CARLYLE JOHNSON MACHINE COMPANY

• MANCHESTER, CONNECTICUT •

REMEMBER WHEN

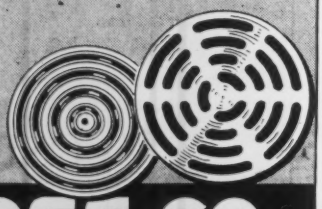




Remember the Horse-car, the Surrey, the Bustle? They were in Vogue 60 years ago when they designed the poppet valve heart for compressors. Incredible as it may seem, some engineers, plant owners, and managers still follow the old principles, old practices, and old methods of the 1880's. Why not Modernize with VOSS VALVES *? Hour by hour, day by day, they save Time and Money, which is the principal business cost.*

WRITE FOR CIRCULARS AND REFERENCES EXPLAINING ALL ABOUT

J. H. H. VOSS VALVES
REG. U.S. PAT. OFF.



J.H.H. VOSS CO.

785 EAST 144th STREET NEW YORK 54, N. Y.

LINEAR "PAR" PACKINGS

Seal In HYDRAULIC POWER

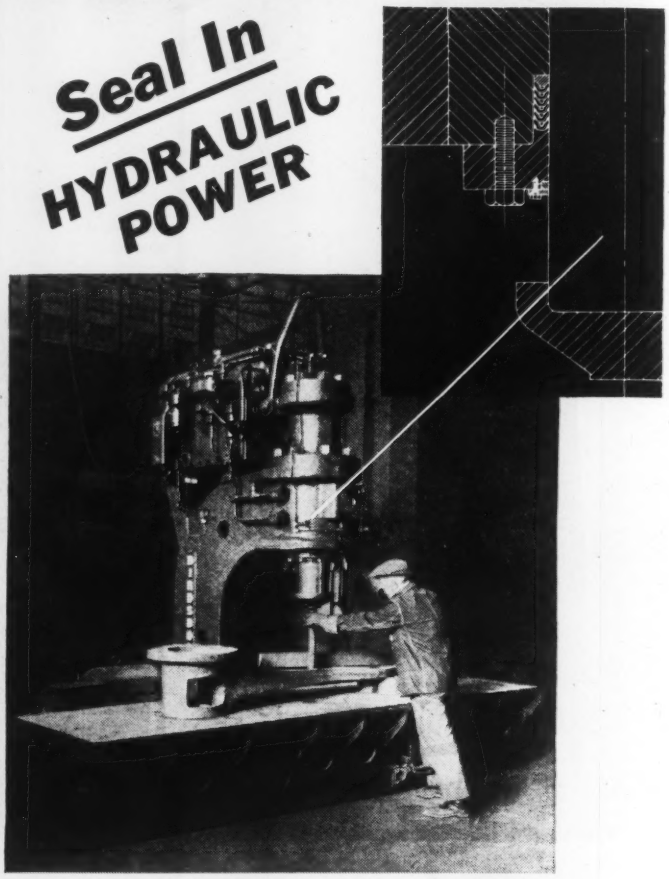


Photo & sketch courtesy Birdsboro Steel Foundry & Machine Company, Birdsboro, Pa.

Oil is the hydraulic fluid which powers this Birdsboro Straightening press . . . C-Housing type. And again, Linear was called upon to furnish the packing rings which efficiently fit into the precision design of the actuating mechanism. The main ram delivers 50 tons pressing force under 3000 pounds per square inch pressure.

Linear "Par" packings effectively seal in the vital hydraulic power from source to point of application. All the power produced by the press is delivered at the ram aided by Linear's fluid-tight, thoroughly dependable seal . . . the seal which is the direct result of Linear "Par" packing's precision design, exacting production and meticulous inspection.

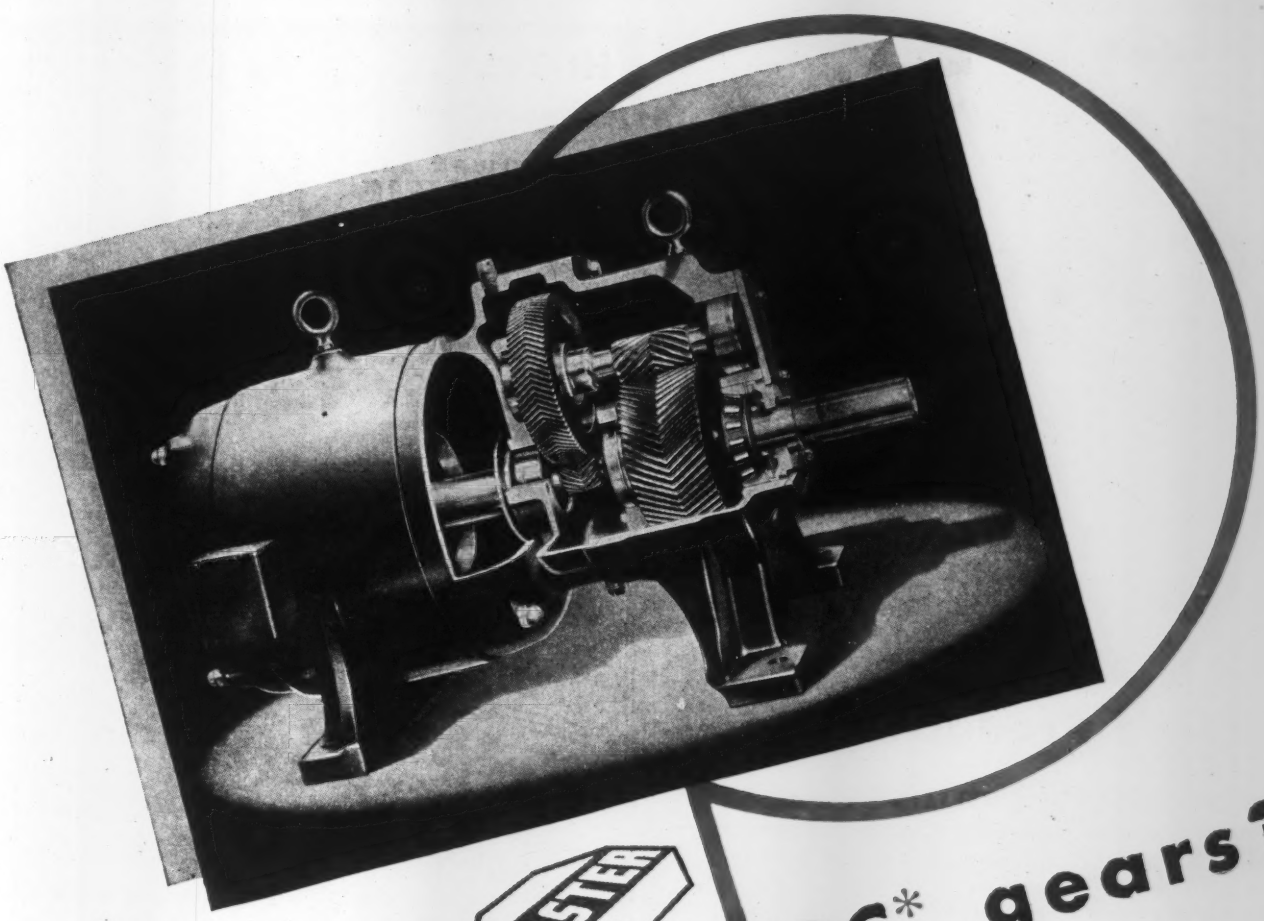
Unaffected by oil, impervious to *any* fluid employed as a pressure medium, Linear "Par" packings are manufactured from six compositions each for a specific service. Engineers of the most modern hydraulic equipment have selected "Par" packing — confident of its ability to aid hydraulically actuated mechanisms in delivering peak performance.

The consultation of Linear engineers is available . . . ask Linear to cooperate with your designers in stepping up the efficiency of *your* hydraulic products. Sample packings for your experimentation upon request.

LINEAR

PACKING & RUBBER CO.

STATE ROAD & LEVICK STREET
TACONY, PHILADELPHIA 35, PENNA.



Why does MASTER use these PC* gears?

Because, in the company's own words, they are "quiet, highly efficient and free from chattering."

Smooth, quiet operation, high efficiency and other operating advantages stem from precision manufacture and characteristics of design inherent in continuous tooth herringbone gears of the Sykes type. Overlap or interlacing of the teeth, gradual engagement and inclined line of pressure assure maintenance of correct tooth action throughout the life of the gears, and contribute to continuous operating efficiency and maintenance economy.

Another important factor is the *backbone,* where the two helices meet to form continuous teeth, instead of being separated by a center groove. The entire face width is thus put to work, providing extra strength and high load-carrying capacity in small space—a definite advantage when a compact, light weight, trouble-free drive unit is desired.

The advantages of Farrel-Sykes continuous tooth herringbone gears are available to you, too. You can do as the Master Electric Company does—cut them in your own plant on Farrel-Sykes machines. Or, if you prefer, we can make these gears for you in our Buffalo plant, where we have specialized on gear design and manufacture for a quarter of a century.

* PRECISION CUT by the famous Farrel-Sykes process of gear generation.

The advantages of Farrel-Sykes Gear Generators for high-speed, economical production of accurate gears are well known to many gear and machinery manufacturers. The versatility, speed, precision and economy of these machines make them a profitable investment. Available in five sizes for generating gears from the smallest practicable minimum to five feet in diameter.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONN. BUFFALO, N. Y.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Pittsburgh, Akron, Los Angeles, Tulsa, Houston

FARREL
The Gear with a Backbone

Farrel-Birmingham

C. M. H. Stainless Steel BELLOWS Are Standard Production Items

C. M. H. Stainless Steel BELLOWS are standard production products, hence, shipping delays are minimized. All the advantages of *Stainless Steel* have been utilized in the art and craftsmanship of C. M. H. BELLOWS. They are the solution to both difficult and tight requirements.

C. M. H. Stainless Steel BELLOWS are corrosion resistant and operate efficiently at either high or low temperatures. They have the qualities required for handling high pressures—which may be further increased by multiple ply construction, where needed. And the uni-metal assemblies and ferrous fittings attached by circular seam welding, assure non-corrosion of the assembled parts.

C. M. H. engineers and production will help you solve your immediate bellows problems—where they are to be required for valve stem housing on vacuum equipment, thermostats, pressure controls, valves, recording instruments, hydraulic mechanisms, rotating shaft seals, or other purposes. Write for complete information today.

Ask for Chicago Metal Hose Engineering Take-off Form SSB2 on which to submit your bellows requirements. It will save you time — assure more accurate, expeditious handling.

Flexible Metal Hose for Every Industrial Use

CMH CHICAGO METAL HOSE CORPORATION
MAYWOOD, ILLINOIS

Plants: Maywood and Elgin, Ill.

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6 Sizes . . . 50 to 150 H. P. . . . 125 and 150 lbs. W.P. Quick steaming all-welded portable boiler with refractory lined firebox and 2-pass tubes to save fuel.

75 Years Boilermakers

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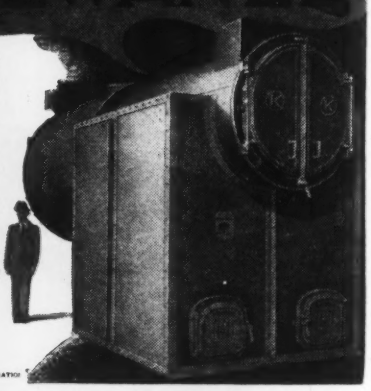
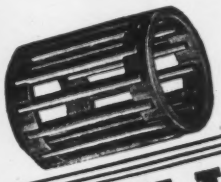


KEWANEE BOILER CORPORATION Kewanee, Illinois

Division of American Radiator & Standard Sanitary Corporation



GWILLIAM ROLLER BEARINGS

STANDARD SIZES LISTED IN CATALOG No. 17
Copy on request

THE GWILLIAM CO. 360 FURMAN ST. BROOKLYN, N. Y.

Turkey...

and Holly...

and Christmas Seals

THEY only come once a year—turkey and holly, carols and cranberry sauce!

And only once a year do you get a letter enclosing the seals that save life — *Christmas Seals.*

Answer the letter! Christmas Seals make possible the year-round fight against Tuberculosis and are *your gift to all humanity.*

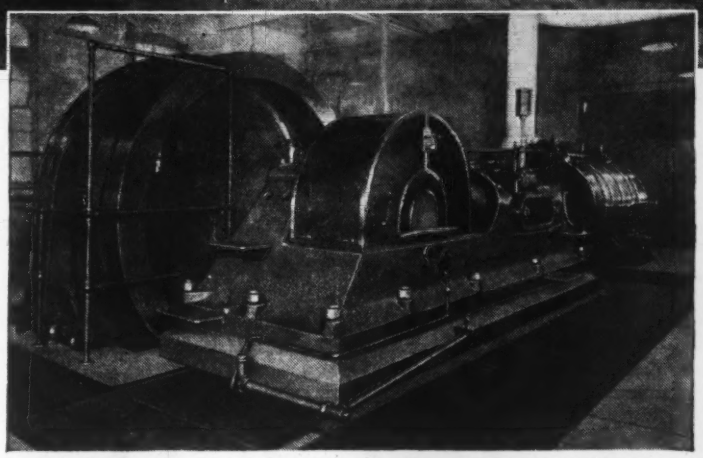
What better way to remember His birthday?

BUY CHRISTMAS SEALS!

The National, State and Local Tuberculosis Associations in the United States

SKINNER "UNIVERSAL UNAFLOW" STEAM ENGINES

Generate Electric Power for 7



Merrimack Woolen Mills, Dracut, Mass., and the 750-kv.a. Skinner "Universal Unaflow" engine-generator unit.

M. T. STEVENS AND SONS — Founded 1813

M. T. STEVENS & SONS CO.

MANUFACTURERS OF

WOOLEN AND WORSTED FABRICS

M. T. Stevens & Sons Co., of North Andover, Mass., was founded in 1813, by the grandfather of Nathaniel Stevens, now president of the company. In that same year Lawrence met his death on board the "Chesapeake" outside Boston, and Perry won his victory on Lake Erie. It was the next year that Francis Scott Key penned our national anthem.

Through four great wars, and now in the fifth, this old reliable company has been furnishing fabrics for uniforms and other military purposes, and making millions of blankets for the armed forces. Stevens woolens and worsteds have an enviable reputation throughout the men's and women's wear and automobile upholstery trades.

For such textile mills an economical and dependable power supply is essential; and in many cases this power can be generated, with "Universal Unaflow" Steam Engines, largely as a by-product of process steam usage.

A remarkably large percentage of our business comes from those who already have Skinner engines. M. T. Stevens & Sons Co. is a typical "repeat" customer. In addition to the "Universal Unaflow" engine which generates electric power for Stevens' Merrimack Woolen Mills, there are four of these engines in their Minterburn, Hockanum and American Mills at Rockville, Conn.

More than 2,000 power users, in industries and institutions of various types, have found it more economical to generate their electric power with Skinner "Universal Unaflow" Steam Engines. Literature describing these engines, and a List of Users, will be sent upon request.

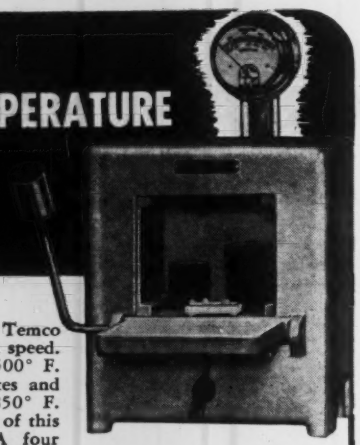
Do More Than Before—Buy EXTRA War Bonds

ARMY E NAVY

For Over 75 Years, Doing One Thing Well—Building Steam Engines

SKINNER ENGINE COMPANY, ERIE, PA.

FAST HEATING
*UNIFORM TEMPERATURE
HANDY
PORTABLE



● The heating element in the Temco furnace operates with unusual speed. A working temperature of 1500° F. is attained in only 30 minutes and intermittent peak loads of 1850° F. are within the practical range of this rugged, long life furnace. A four point switch provides temperature control in four ranges and adjustable rheostat bands allow close heat selection within any range. The accurate, dependable pyrometer is calibrated to 2000° F. and 1100° C. in 50° increments.

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COMPLETE WITH PYROMETER (115 V.).....$42.50

For 230 V.—$5.00 additional

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THERMO ELECTRIC MFG. CO., 469 W. Locust Street, Dubuque, Iowa

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Francis EST. 1880. Hydraulic PRESSES

Here's a general purpose, low cost press 12" x 12", 18" x 18", 24" x 24" and 30" x 30" in size and in a choice of combinations typical of Francis Presses available in various sizes, speeds, pressures, types of pumping units and with or without electric or steam hot plates. Write.

Machinery Mfgrs. Since 1880

CHAS. E. FRANCIS CO.
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MECHANICAL ENGINEERING
November, 1944 CARD INDEX Vol. 66, No. 11

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THEY'RE *KNURLED* ★

for Speed and Safety

The knurling of these two screws is one of their most distinctive features. The KNURLED HEAD of the "Unbrako" Socket Cap Screw makes it easy for mechanics' oily fingers to grip it firmly . . . turn it farther and faster before a wrench is needed.

The KNURLED POINT of the "Unbrako" Hollow Set Screw makes it truly a Self-Locker, by digging in and preventing the screw from unwinding, regardless of vibration. Yet it is easily removed and can be used over and over again.

Where the Knurled Point "Unbrako" Hollow Set Screw is unsuitable, use our Knurled Thread Set Screw, which is also a Self-Locker, regardless of the style of point.

Sizes in both screws: No. 4 to 1½" diameter. Full range of lengths.

To learn more about the advantages of these and other "Unbrako" Screw Products, send for the "Unbrako" Catalog.

ARMY E NAVY

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OVER 40 YEARS IN BUSINESS
STANDARD PRESSED STEEL CO.
JENKINTOWN, PENNA. BOX 558
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TO WEATHER POST WAR *UNCERTAINTY*

Naturally you want to establish yourself quickly and permanently in the post war era. To help you, Blaw-Knox offers engineering and products of wide range. It also has the facilities and personnel to manufacture for you, all or parts of your products.

One of the most important activities at Blaw-Knox is the Process Equipment Department, which among other things, specializes in the design and manufacture of equipment for the carrying out of chemical reactions by both the batch and continuous processes. This department is fully qualified to render a complete service from building pilot plants to equipment for full scale production.

Blaw-Knox leadership in the origination and fabrication of products for so many fields of industry is a ground for confidence that it can be of help to you if your business comes within the scope of its activities. Many Blaw-Knox products now of international reputation were originated to fill the needs of one manufacturer. Perhaps the Blaw-Knox umbrella of industrial coverage can include worth while services to you. May we talk it over?

A chemical plant designed, fabricated and erected by Blaw-Knox for large midwest manufacturer.

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A PACEMAKER FOR AMERICAN INITIATIVE AND INGENUITY

2024 FARMERS BANK BLDG., PITTSBURGH, PA.

Buy More War Bonds and Stamps

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NATIONAL ALLOY STEEL DIVISION, Heat and Corrosion-Resistant Alloy Castings

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ANTI-AIRCRAFT GUN MOUNTS · GUN SLIDES · LANDING BARGES · AERIAL BOMBS · POWDER PLANTS · PIPING FOR NAVAL VESSELS · SYNTHETIC RUBBER PLANTS · CAST ARMOR FOR TANKS & NAVAL CONSTRUCTION · CHEMICAL PLANTS

What's in a name?

When the name is "Hallowell" it stands for tops in SHOP EQUIPMENT OF STEEL. Thousands of users all over the country know that it signifies sturdy construction, good design, years and years of wear, and economical prices.

"Hallowell" Work-Benches of Steel are an asset in any shop. Exceptionally strong and sturdy, they are built to stand firm and rigid without costly bolting to the floor. Over 1300 ready-made, interchangeable combinations make it possible for "Hallowell" Benches to fill almost any requirement. Save time, effort, money—order "Hallowell."

The "Hallowell" Line includes Benches, Tool Stands, Foremen's Desks, Trucks and Stools.

HALLOWELL

Write for "Hallowell" Catalog

Fig. 1734. Steel Bench from the "Hallowell" *DeLuxe* Line. Available NOW in a number of arrangements.

STANDARD PRESSED STEEL COMPANY
JENKINTOWN, PENNA.
BOX 558

Fig. 928. "Hallowell" Steel Work-Bench with laminated wood top. Drawer is extra. Pat'd. & Pats. Pend.

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The QUESTION BOX:

- How can you humidify 40,000 cu. ft. of space for less than 2¢ an hour?
- Where can you get complete data on humidification by the steam type, unit system?

YOU can find the answers to the above and many other questions in the new Armstrong Humidifier Technical Bulletin No. 158 which shows you how to avoid the evils of winter heating dry air, at low cost.

ARMSTRONG MACHINE WORKS
894 Maple Street, Three Rivers, Michigan

YES! I want a copy of your Humidifier Book No. 158 containing valuable information about steam type humidification.

NAME.....

COMPANY.....

ADDRESS.....

Please Check: ☐ Plant Engineer ☐ Consulting Engineer ☐ Student Engineer

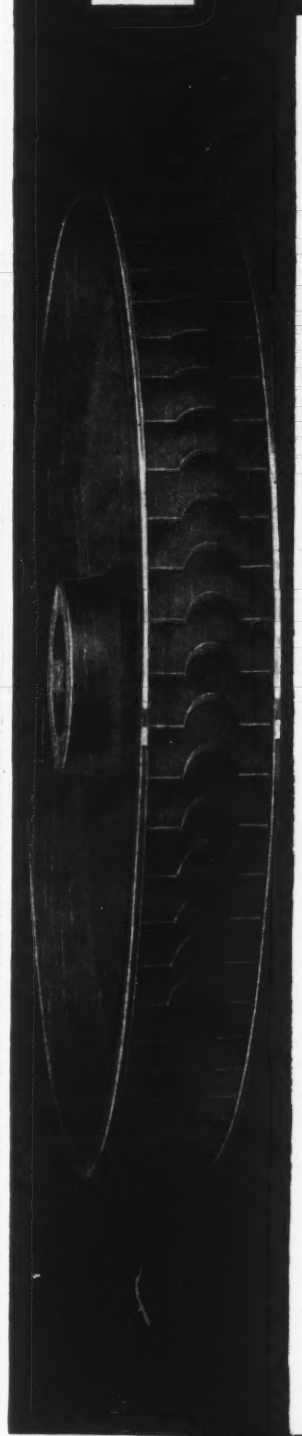
CONSULTING ENGINEERS INDEX

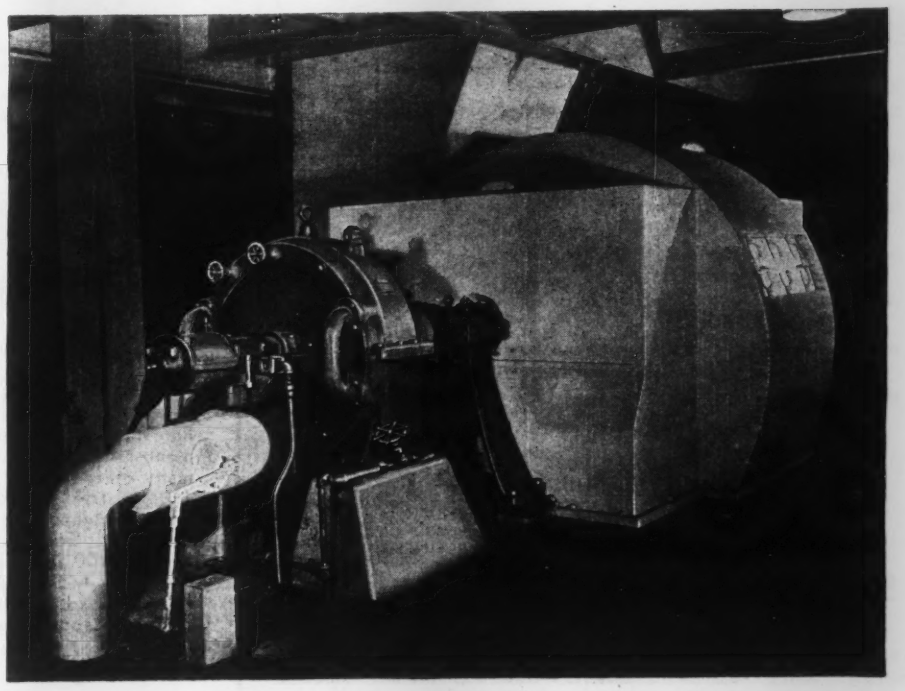
This index serves as a ready reference when seeking aid in any engineering problem or for any technical service that may be required.

Refer to pages 158 to 164 in the 1944 A.S.M.E. Membership List recently issued. This Index groups geographically those A.S.M.E. Members engaged in consulting practice and includes consulting engineers, management consultants, specialists, patent attorneys, constructors and contractors.

Supplementing this general index is a Classified Specialty List of 93 of the Consultants advertising their specialized lines of practice.

TERRY





BUCKETS AND ROTOR IN THE TERRY WHEEL TURBINE

. . ALL IN ONE PIECE

In the Terry Turbine the wheel is made from a single forging of special composition steel. The buckets are milled directly in the wheel. There are no parts to become loose or work out. Such construction makes for long life and low maintenance.

This and many other features of Terry Wheel Turbine design are described in our Bulletin S-116. A request on your business letterhead will bring a copy.

ABOVE: 250 H. P. Terry Wheel Turbine driving Induced Draft Fan. Unit is one of ten Terrys installed in a mid-western plant.

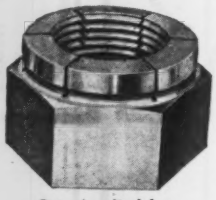
T-1153

THE TERRY STEAM TURBINE COMPANY
TERRY SQUARE, HARTFORD, CONN.

Why you should order the

"FLEXLOC"

STOP and LOCK NUT



Pat. Applied for

Because:

- It is of one-piece construction
- It can be made of any of the conventional nut materials
- Every thread—including locking threads—takes its share of the load
- Its construction is especially advantageous for thin nuts
- It accommodates itself to a very wide range of thread tolerances
- It can be used over and over again without losing its ability to lock
- It is not affected by temperatures likely to be met with in the field of Mechanical Engineering
- Being a "stop" nut, it stays locked in any position on a threaded member

Sizes from #6 to 1" diameter.
Millions in use.
Write for Bulletin 582

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— BRANCHES —

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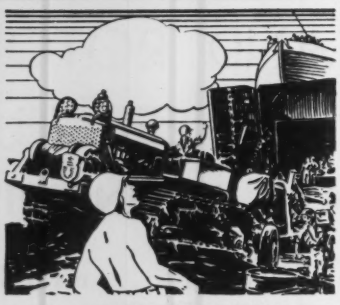
HOW DIESEL TRACTOR Power Transmission WILL HELP GIVE More Horsepower To TOMORROW'S TRUCKS

Hauling heavy equipment up sandy beaches, filling in shell craters and brushing away jungle growth has developed clutches that will enable tomorrow's truck trains to haul the heaviest loads over the roughest roads. Let our engineers show you how you can improve your post-war models by using these



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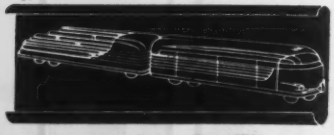
SEND FOR THIS HANDY BULLETIN ON POWER TRANSMISSION CONTROL

It tells and shows how ROCKFORD CLUTCH and POWER TAKE-OFF applications are saving time, power and money in transport equipment and a wide variety of industries. Gives capacities, dimensions and specifications.

They provide for instant pick-up, convenient power transmission control and smooth gear shifting—with disengagement maintained by light foot-pedal or hand-lever pressure.



ROCKFORD DRILLING MACHINE DIVISION *Borg-Warner Corporation*

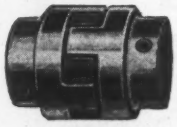
▲ 1307 Eighteenth Avenue, Rockford, Illinois, U. S. A. ▲

WHETHER YOU REQUIRE COUPLINGS FOR THE

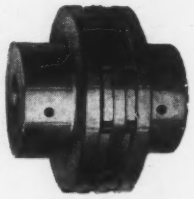
Light Duties

OR THE

HEAVIEST DUTIES



L-R Type "IA"
Pat. & Pats. Pend.



L-R Type "W"
Pat. & Pats. Pend.

For duties ⅛ to 50 h.p., L-R Type "IA" (above) has long outstanding pre-eminence. It is for the most widely used of all couplings. For fan and air-conditioning, small pumps, fractional h.p. motors, a multitude of uses. Only 3 parts, 2 metal jaws and resilient spider.

For steel, rubber and cement mills, excavating, and many other services. Bores 1¼" to 16¾". Approximate weights from 9 to 3,000 lbs. For duties from 2 to 2,500 h.p. at 100 r.p.m. Individual free-floating load cushions of material adapted to services.

There's an L-R Coupling exactly suited to your duty and *kind* of service

L-R FLEXIBLE COUPLINGS

L-R "Resilient Alignment" Couplings with free-floating cushions hung between rugged metal jaws, are free to adjust instantly to every emergency—or correction of misalignment, absorption of surge, shock, and vibration, as well as wear on bearings, etc. Internal friction is eliminated. Couplings are extremely free from noise. Cushions always in plain sight for inspection. NO SHUT-DOWNS NECESSARY FOR CHANGING. No lubrication *ever* required.

SEND FOR COMPLETE CATALOG AND QUICK-FINDING SELECTOR CHARTS

★

These handy Charts enable you to find couplings you are looking for without tedious figuring. Special couplings engineered.

Wire or Write

LOVEJOY FLEXIBLE COUPLING CO.

5032 W. Lake St. Chicago 44, Ill.

SPERRY ELECTRONIC FLAW DETECTOR

saves $2000 per week in tool breakage!

Rejected bar with only tiny surface flaw noticeable.

Depth and length of same flaw exposed by filing.

Each bar can be inspected at the rate of 80 feet per minute or more. Flaws or inclusions as short as 1/16-inch are detected electronically.

How RCA Electron Tubes Help Locate Hidden Flaws in Bar Stock

THIS is the story of a New England manufacturer* who used electronic inspection to solve his problem of excessive tool breakage.

In machining parts from brass bar stock, invisible flaws and inclusions in the brass caused tool breakage costing over $2000 per week.

To solve the problem, an electronic flaw detector, developed and manufactured by Sperry Products, Inc., Hoboken, N. J., was purchased to inspect all stock before machining. The new inspection method detects defects which would cause tool damage and resulting shut-down. In the first six weeks of operation, *not one tool was broken, tool wear was sharply reduced, and production increased 60%!*

How Does It Work? The Sperry electronic flaw detector consists of an electron-tube oscillator, a detector coil, and a sensitive electron-tube indicator. The oscillator supplies alternating current to the detector. The brass is passed through the detector (see photo). If a flaw is present, the indicator circuit signals the operator and stops the machine. Seventeen small RCA electron tubes are used.

*Name on request

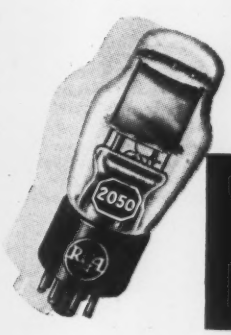
Defects as short as 1/16-inch can be located in both ferrous and non-ferrous materials. The detector works equally well on welded or seamless tubing and on bar stock, and locates external or internal defects, such as splits, seams, and inclusions.

Advantages: In addition to preventing damage to tools and machines, automatic electronic detection improves product quality, reduces final inspection rejections, and prevents failures in the field caused by defective material.

For Further Information on the electronic flaw detector write to Sperry Products, Inc., Hoboken, N. J. If you have some *other* problem involving the use of electron tubes, RCA tube application engineers will be glad to help you or to put you in touch with a manufacturer who can.

For a copy of the free 32-page booklet "Electrons in Action at RCA" which shows electronic devices at work in our own factories, write to Radio Corporation of America, Dept. 62-18H, Harrison, N. J.

Remember, the Magic Brain of all electronic equipment is a Tube . . . and the fountain-head of modern Tube development is RCA!



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25 Years of Progress in Radio and Electronics

RCA

BUY WAR BONDS

62-6331-18

RADIO CORPORATION OF AMERICA

RCA VICTOR DIVISION • CAMDEN, N. J.

If You're Waiting for a Home Telephone

IF YOU are waiting for a home telephone, we think we know how you feel.

You'd like a telephone now—not weeks or months from now. And we'd like to install it for you now.

But due to the war we are short of switchboards and telephones, so there will be unavoidable delays in filling orders for home telephones.

The delay will be as short as we can make it. Meantime, we are genuinely grateful for all your patience and co-operation.

BELL TELEPHONE SYSTEM

Representatives—Sales Agencies
Businesses For Sale
Partnership—Capital
Manufacturing Facilities

OPPORTUNITIES

Positions Open—Positions Wanted—Equipment, Material, Patents, Books, Instruments, etc. Wanted and For Sale

RATES Classified advertisements under this heading in MECHANICAL ENGINEERING are inserted at the rate of $1.00 a line. 80 cents a line to members of A.S.M.E. Seven words to the line average. A box number address counts as one line. Minimum insertion charge, 5 line basis. Display Advertisements carried in single column units of multiples of one inch at flat rate of $15 per inch per insertion. Maximum Size: 1 column, 7 inches deep; 2 columns, 3½ inches deep. Copy must be on hand not later than the 10th of the month preceding date of publication.

POSITIONS OPEN

Five Pages (123-124-125-126-127) of Opportunities this Month

WANTED . . . .

SOUND JUDGMENT AND AN ENGINEERING BACKGROUND

Opening with large electrical and mechanical manufacturer for work in new products division. Requires familiarity with engineering, manufacturing, sales and management problems. Ability to make engineering and commercial surveys and to guide developments on both war and postwar projects necessary. An interesting position with adequate salary for the right man. A limited amount of aviation background is desirable and both electrical and mechanical engineering experience are essential. Address CA-1109, care of "Mechanical Engineering."

DEVELOPMENT ENGINEER

For the development and manufacture of stainless steel and alloy steel welding electrodes and coatings. Chemical and metallurgical background preferred. Position has excellent postwar possibilities as this man is to understudy our only engineer who is in this activity.

Address CA-1119,
care of "Mechanical Engineering."

MACHINE DESIGNER

An 80-year old machinery manufacturing firm, leader in its field, invites correspondence with a competent machine designer interested in permanent post-war connection.

The man we want values assured employment above a temporary "boom-time" job. He is versatile and old enough to offer a well-rounded general experience in designing; young enough to adapt himself to our organization. He has sufficient executive ability to handle a department of six men and tact to work in harmony with associates and subordinates. He is neither a specialist nor a mass production designer.

Address CA-1168
care of "Mechanical Engineering."

WANTED . . .

TOOL DESIGNERS
DRAFTSMEN
MECHANICAL AND ELECTRICAL ENGINEERS

Excellent Post War Opportunities. N. E. Ohio. Good Living Conditions. W.M.C. Rules Apply.

Address CA-1149,
care of "Mechanical Engineering."

Wanted
ENGINEERS

Radio
Chemical
*** Electrical**
Electronic
*** Mechanical**
Metallurgical
*** Factory Planning**
Materials Handling
Manufacturing Planning

Work in connection with the manufacture of a wide variety of new and advanced types of communications equipment and special electronic products.

Apply (or write), giving full qualifications, to:

R. L. D. EMPLOYMENT DEPT.

Western Electric Co.

100 CENTRAL AV., KEARNY, N. J.
* Also: C.A.L.
Locust St., Haverhill, Mass.

Applicants must comply with WMC regulations

Executive Officer Required

The Newfoundland Industrial Development Board, an organization set up and financed jointly by Government and Industry, requires the services of a qualified Engineer for the office of Director.

The work will involve the planning of investigations that will relate raw materials to new manufacturing processes, personal contacts with industrialists and research and other personnel, and the direction of general activities concerned with the initiation and development of industries.

Applicants will please furnish complete information concerning their past activities and references.

Apply to

Secretary, **Newfoundland Industrial Development Board,**
Board of Trade Building, St. John's, Newfoundland.

ENGINEERS WANTED
FOR POSITIONS WITH A POSTWAR FUTURE

A small integrated, independent oil company needs additional engineers for their Lubricants Research and Development staff as well as their Field Engineering force. These are the positions:

1. AUTOMOTIVE LABORATORY SUPERVISOR—to direct the activities of a new, modern engine test laboratory. Applicant should be under 30 years, and a Mechanical, Automotive, or Aeronautical Engineer with 3 or 4 years' experience in engine design or testing.

2. FIELD ENGINEERS—two positions are being created for men under 35 years of age who have a degree in Mechanical, Automotive, Electrical or Aeronautical Engineering or the equivalent in experience. Only applicants willing to travel extensively will be considered.

3. LUBRICANTS RESEARCH AND DEVELOPMENT ENGINEER—to assist in the development of quality lubricants for automotive gasoline and Diesel engines and their auxiliary equipment, aircraft engines and industrial equipment. Applicant should be under 30 years and a Mechanical, Automotive or Aeronautical engineer, recent graduate preferred.

In reply outline education, experience and draft status, also enclose non-returnable photograph. Address CA-1170 care of "Mechanical Engineering"

ESTIMATING ENGINEERS

Central Pennsylvania metal fabricating plant engaged in war work has openings for estimating engineers. Good opportunity for Returned Veterans with mechanical or electrical engineering degrees. Young college graduates desired. Experience desirable but not absolutely essential.

Address CA-1161
care of "Mechanical Engineering."

DESIGN ENGINEER

Prominent nationally known manufacturer has opening for a resourceful design engineer on large high pressure and temperature automatic steam valves. Permanent position with excellent possibilities for advancement. Submit full details.

Address CA-1194
care of "Mechanical Engineering."

MECHANICAL ENGINEER

Manufacturer of Steam Power Plant equipment wants Proposal Engineer with experience in the design and selection of equipment for steam generating units. Work involves design and selection of equipment, preparation of performance data and guarantees and specification writing. Also opportunity for field work supplementing sales efforts. Location New York. In reply give full personal information, draft status, previous employment record and salary expected. Address CA-1184, care of "Mechanical Engineering."

INDUSTRIAL ENGINEER

Experienced industrial engineer wanted by company with highest rating, building high grade machinery. Permanent position with progressive company with modern, well equipped plant and wide line of old established and nationally known products. Unusual opportunity for advancement based on accomplishments in improving methods and costs. No travelling required. Location is in attractive and progressive New York State community.

Please give full particulars as to age, experience, etc. Correspondence confidential.

Address CA-1193
care of "Mechanical Engineering."

FOR ENGINEERING SALES

Large established industrial manufacturer of precision products used in all kinds of machinery and equipment has opening in Sales Engineering Department for man trained in Mechanical or Electrical Engineering with some shop and drawing room experience, preferably in railway field. This is a postwar proposition with headquarters in Metropolitan New York area. Good opportunity for advancement. Straight salary plus traveling expenses. Age 28 to 35 preferred. Write today giving college, qualifications and other vital information. Applicants chosen for consideration will be interviewed by the man for whom they will work.

Address CA-1190,
care of "Mechanical Engineering."

WANTED
ENGINEERS
MACHINE DEVELOPMENT

Graduate engineer or equivalent, experienced in the design and development of special and experimental machines. Men with creative ability required, experienced in such lines as automatic, semi-automatic, or ordnance equipment.

Must be thoroughly acquainted with modern methods and shop practices and capable of developing new ideas in conjunction with modern mechanical laboratory facilities.

State age, marital status, details of education, experience, draft status, present salary and salary expected. Enclose recent photograph or snapshop.

Post-war opportunity.

Applicants must be able to obtain Statement of Availability.

E. I. du Pont de Nemours Co., Inc.
Personnel Division
Wilmington 98, Delaware

VALVE DESIGN ENGINEER

Established manufacturer of oil field equipment in Houston, Texas, desires to expand its valve line to serve other industries. Applicant should be fully familiar with service requirements of valves for a wide variety of applications, and capable of assuming considerable responsibility in design and development. Application should include age, experience, and salary expected.

Address CA-1186 "care of Mechanical Engineering."

MEN WANTED NOW

TO START IN THESE POSITIONS WITH POSTWAR POSSIBILITIES

Several young men—technically trained or mechanically inclined for work in a General Department, located in the New York Metropolitan Area. Successful applicants will be given special training. These are unusual opportunities for veterans under 30. These men are needed for each of the following assignments:

1. To prepare assembly and operating instructions for oxy-acetylene machines.
2. To prepare sales catalogs and technical booklets on oxy-acetylene and electric welding equipment and applications.
3. To prepare technical bulletins, sales catalogs, and technical articles on synthetic organic chemicals.
4. To assist in the preparation of advertisements, educational exhibits, motion pictures, and slide films.

Engineering or chemistry degrees helpful, but not essential—opportunity to advance in Sales, Engineering Development or Promotion activities.

Send to Mr. F. P. Kinson, Room 605, 30 East 42nd Street, New York 17, N. Y., in confidence, full details of education and experience, if any; and what you hope this background will help you to become eventually; salary expected; and snapshot (not returnable) with first reply.

Applicants, other than veterans, must be able to get a statement of availability.

UNION CARBIDE AND CARBON CORPORATION
An Essential Industry

Five Pages— 123-124-125-126-127 of Opportunities

MACHINE DESIGNERS

Experienced on the design of special machinery. Excellent opportunity for first class men interested in steady positions in New England.

Only men 35–55 with a record of successful achievements will be considered. In replying furnish information preliminary to a conveniently arranged interview. Address CA-1084, care of "Mechanical Engineering."

ENGINEERS

Internationally known manufacturer of bulk material handling equipment, located in the midwest, needs—

STRESS ANALYST & DESIGNER

also

PROJECT ENGINEER

also

DRAFTSMEN

ambitious to graduate into

SALES POSITIONS

Permanent positions for good men. Please supply full details in confidence.

Address CA-1163,
care of "Mechanical Engineering."

HEATING AND VENTILATION DESIGN ENGINEER

A graduate mechanical engineer, 30 to 40 years of age, possessing supervisory ability, experienced in the design, layout, and specification of heating, ventilation and air conditioning equipment for industrial plants.

Give full experience, education, age, present salary and salary expected. Enclose snapshot.

It will be necessary to observe the rules and regulations of the War Manpower Commission.

Location—Wilmington, Delaware.

Postwar opportunity.

E. I. duPont de Nemours & Co.
Personnel Division
Wilmington 98, Delaware

POWER DESIGN ENGINEER

A graduate mechanical engineer, 30 to 40 years of age, possessing supervisory ability, experienced in the design of power plant installation.

Public utility or industrial power design experience is desirable and applicant should be well grounded in thermodynamics.

Give full experience, education, age, present salary and salary expected. Enclose snapshot.

It will be necessary to observe the rules and regulations of the War Manpower Commission.

Location—Wilmington, Delaware.

Postwar opportunity.

E. I. duPont de Nemours & Co.
Personnel Division
Wilmington 98, Delaware

YOUNG MECHANICAL ENGINEER

For design and development of new materials testing machines with small, progressive company. Excellent post-war prospects.

SONNTAG SCIENTIFIC CORPORATION
Greenwich, Conn.

Mechanical - Designer Draftsman wanted on permanent work near New York City. Should be familiar with foundry and machine shop practice. Technical Education desirable. Good working conditions. This is a good opportunity for the right man. All replies confidential.

Address CA-1191
care of "Mechanical Engineering."

JOHN INGLIS CO. LIMITED,

TORONTO

has openings for fully qualified Mechanical Engineers for layout and development work on Steam Power Plants, Pulp and Paper Mill Machinery, and Mining Machinery; also capable Executive Engineer to supervise development program.

In replying please give complete personal and professional history and salary expected. Applicants must comply with order-in-council #246.

MECHANICAL DRAFTSMEN AND DESIGNERS of experience for special processing and converting machinery. State experience. Location in New Jersey Metropolitan Area. This is a post war position. W.M.C. rules apply. Address CA-1117, care of "Mechanical Engineering."

TOP FLIGHT ENGINEER—experienced in vibration control—immediate and postwar development. Address CA-1118, care of "Mechanical Engineering."

LAYOUT ENGINEERS—designers, design draftsmen. Preferably with design experience on gas or Diesel engines, air compressors, etc. For actual drawing board work on layout and development of design on long range research project for U. S. Navy. The Baldwin Locomotive Works, Eddystone, Pa. Statement of availability for W.M.C. required.

MECHANICAL ENGINEER who is experienced in design of wire mill machinery and wire insulating equipment, to work in engineering and drafting office of manufacturer of electrical conductors located in New York State. Address CA-1138, care of "Mechanical Engineering."

EXPERIENCED DESIGNER—Wanted for Machine tools, good opportunity with old established company; give full particulars as to experience and salary desired; application will be treated as confidential. Address CA-1142, care of "Mechanical Engineering."

EXPERIENCED ESTIMATOR—For position with large company in California. In applying be sure to state salary expected and enclose a recent photograph. Interviews will be arranged. Address CA-1145, care of "Mechanical Engineering."

MECHANICAL OR CHEMICAL ENGINEERING GRADUATE—Under 30, with 2 to 5 years' general experience in process industry, to serve as Refinery Engineer. Should have some construction experience and supervisory ability. Position offers good future in progressive organization for one with sound training and sense of responsibility. Submit full details, small photograph and state approximate salary requirements. P. O. Box 388, Warren, Pa.

DEVELOPMENT ENGINEER—Well established manufacturer, whose regular products are in wartime production, has a permanent opening for a qualified mechanical engineer. Design and developmental work on special machines and hand tools. Chicago area. In reply please give full details as to education, experience, age, etc. Address CA-1150, care of "Mechanical Engineering."

WRITER—Engineering background, write features on national magazine staff; popular, non-technical style. State qualifications. Address CA-1154, care of "Mechanical Engineering."

ENGINEER—Capable of original design to work on small tractor and tools. Address CA-1157, care of "Mechanical Engineering."

MAN WITH TECHNICAL AND ENGINEERING TRAINING—To prepare lubrication recommendations and technical data on industrial petroleum products. Preferably a man who can write articles on lubrication and make machinery builders' recommendations for lubricating oils and greases. In applying, give information as to educational training, practical experience and age. Address CA-1158, care of "Mechanical Engineering."

DESIGNERS, DRAFTSMEN, STRESS ANALYSTS—Wanted for internal combustion engine development with established truck manufacturer. Send photograph, outline of experience, minimum salary with application. Location, East. Address CA-1162, care of "Mechanical Engineering."

SALES ENGINEER—Experienced in the field of Precision, Scientific and Optical Instruments for Industrial, Institutional and Laboratory users. Must have technical background and sales organization ability for setting up and developing the post war markets for a substantial and well equipped New York corporation manufacturing the highest types of Instruments and Optics. This is a real opportunity for the right man to head-up our sales engineering department for post-war work. Write fully education background and experience. Replies strictly confidential. Address CA-1164, care of "Mechanical Engineering."

WORKS MANAGER—Experienced manufacture small parts and assembly. Excellent post-war. Salary $18,000 to $20,000. Address CA-1165, care of "Mechanical Engineering."

SUPERVISOR OF TOOL DESIGN—Old well established company. Good post-war prospects. Small parts manufacture. Salary $7,000 to $8,000. Address CA-1166, care of "Mechanical Engineering."

CHIEF INDUSTRIAL ENGINEER—With considerable experience in small parts manufacture. Good post-war. Salary $7,000 to $8,000. Address CA-1167, care of "Mechanical Engineering."

SUPERINTENDENT—Well established heavy industry making equipment for cutting and forming sheet metal has opening. Give details of education, personal qualifications and work history in letter of application which will be held in confidence. Statement of availability required. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y.

WORKS MANAGER—Well established heavy industry making equipment for cutting and forming sheet metal has opening. Give details of education, personal qualifications and work history in letter of application which will be held in confidence. Statement of availability required. Niagara Machine & Tools Works, 683 Northland Avenue, Buffalo 11, N. Y.

MECHANICAL ENGINEER—For Plant Layout Department. Experienced in designing mechanical services for production processes and building facilities, involving liquid and gaseous fuels, ventilation, and electric power distribution. State experience, age, salaries received, etc. Corning Glass Works, Corning, N. Y.

MATERIALS HANDLING ENGINEER—Mechanical engineer preferred. Will be responsible for the planning of all materials handling facilities from receipt of raw material to shipping of finished product. State experience, age, salaries received, etc Corning Glass Works, Corning, N. Y.

PRODUCTION SUPERINTENDENT—Large established Laundry-Cleaning Company, New England, Age 30-45, Mechanical Engineer or Industrial Engineer, Christian, experienced wage incentives, personnel relations, salary $120. Address CA-1180, care of "Mechanical Engineering."

DRAFTSMAN with some experience in gas engines and pneumatic devices wanted by small progressive company in New Jersey town within 60 miles of New York City. Living conditions and surroundings good. Position will continue in the postwar period. Submit full details in first letter. Address CA-1196, care of "Mechanical Engineering."

DESIGN ENGINEERS AND DRAFTSMEN—experienced hydraulic press designers and detail draftsmen. Permanent, good salary, excellent opportunity. WMC rules observed. Address CA-1197, care of "Mechanical Engineering."

INSPECTOR—Mechanical Engineering degree or suitable equivalent to inspect equipment in chemical plant located in metropolitan Detroit area. Permanent Position. Must be thoroughly familiar with pressure vessels, piping, etc. Write giving full details including references and salary desired. Address CA-1199, care of "Mechanical Engineering."

POSITIONS WANTED

RESEARCH AND DEVELOPMENT ENGINEER

Professional registration eastern state, thorough knowledge mechanical and thermodynamic design—TURBO MACHINERY—and related apparatus, latest experience extreme temperature applications available pending completion of present project. Wishes connection with research minded concern or association with consulting firm. Address CA-1179, care of "Mechanical Engineering."

MANUFACTURING AND ENGINEERING EXECUTIVE—With automotive and heavy industry background, M.E., 46, all around experience. Address CA-1151, care of "Mechanical Engineering."

CHIEF MECHANICAL ENGINEER (M.E. Master Degree)—At present in charge of Mechanical Engineering Department of large Shipyard with design staff, desires connection with post-war future—not necessarily in shipbuilding. Twenty years' experience in Power and Steam Engineering, High and Low Pressure Piping, Boiler and Engine Room Layout and Installation, Heating and Sanitary Engineering. Design, Testing, Specification, Supervision. Practical and theoretical experience Address CA-1152, care of "Mechanical Engineering."

MECHANICAL ENGINEER—B.S., 34 years old, married, ten years' experience including petroleum production, tool design for precision instruments, product development and supervision Desires work with manufacturer of instruments for oil fields Address CA-1169, care of "Mechanical Engineering."

ENGINEER EXECUTIVE—age 50, graduate C.E., 25 years' exceptionally broad experience in industrial plant engineering, manufacturing and construction, design of plants, machines and equipment, plant layouts and process studies, materials handling, production planning, etc., in the steel base metals, auto and chemical industries, including 6 years in Latin America. Efficiency minded, can organize and lead department, available as Chief or Works Engineer. Prefer Pacific Coast, Middle West, or Overseas Address CA-1185, care of "Mechanical Engineering."

MECHANICAL ENGINEER—Graduate, 27, Experience: one year shipyard, one year design and detail of steel mill equipment, two years in aircraft. Desires production engineering position Address CA-1189, care of "Mechanical Engineering."

ENGINEER AND ESTIMATOR, age 37, married, 3rd year university undergraduate, Mechanical Engineering, 15 years' experience on installation, estimating and design of Steam Power Plants, Steam Heating, Air Conditioning, Refrigeration, Ventilation, Plumbing and Water Supply Systems. Location preferably South Eastern or South Western States, but other locations very definitely considered. Address CA-1195, care of "Mechanical Engineering."

READ the --- CLASSIFIED ADVERTISEMENTS

appearing in this section each month

It will pay you to watch the announcements on these pages for an opportunity that you may be looking for or one that may be of interest to you.

Five Pages of Opportunities this Month—123-124-125-126-127

ENGINEERING EXECUTIVE—43—Graduate M.E.—Member A.S.M.E. Supervisor Plant Layout—Consultant on Plant Design and Construction—Now employed with one of the three largest automobile manufacturers in Detroit—With this company for sixteen years—Past record includes design, layout, construction of several industrial plants and their equipment for the mass production of automobiles and component units. Large projects directed and supervised. Designs, specifications, estimates, purchasing for equipment; new methods and processes devised and laid out; conveyors, ventilating systems, drying, heating, piping, structural steel, concrete structures; Assembly lines, metal stamping, finishing, painting, electroplating, heat treating, forging, machining plants. Supervision of drafting and designing department. Allocation of contracts and supervision of construction by contractors. Desires top salaried position with large industrial organization or consulting engineering firm. Will take one or two year contract for the development of single projects or will consider permanent position with postwar future. Address CA-1173, care of "Mechanical Engineering."

ENGINEER—43, graduate, licensed. 18 years of broad experience in industrial plant equipment, electric power, refrigeration, heating and ventilation, drying and air conditioning, covering design, application, sales and executive duties. Desires permanent responsible position in Metropolitan New York. Address CA-1176, care of "Mechanical Engineering."

CENTRAL OR SOUTH AMERICAN—Position desired by ambitious Engineer. Age 32, M.E. degree, Cornell graduate. Ten years' experience in design, installation, and maintenance of mechanical equipment. Has had previous experience in foreign positions. Available immediately. Address CA-1177, care of "Mechanical Engineering."

MECHANICAL ENGINEER—thorough knowledge Portuguese and Spanish, Bach. of M.E., age 26, over 4 years' varied engineering experience, Wright Field, member Tau Beta Pi, alert, personable, seeks responsible and challenging position, using languages and real engineering, preferably abroad. Highly deferred in draft, has W.M.C. release. Robert M. Rey, P. O. Box 848, Dayton 1, Ohio.

MECHANICAL DESIGN ENGINEER—23 years' engineering and machine shop experience. Well versed in tool, die, jig and fixture design, product development, metal processing, modern production methods; engineering and manufacturing standardization. 14 years on Mechanical Engineering faculty of a large University, 4 years Assistant Chief Engineer and 5 years on Engineering design for several nationally known metal products manufacturers. Capable supervising any or all above activities. Desires to make connection with established manufacturing concern. Available November 15. Address CA-1181, care of "Mechanical Engineering."

MECHANICAL ENGINEER—Graduate, 28, married. 2½ years' experience in fabrication analysis of pressure vessels, piping and instrumentation, economic studies and estimates of layout and construction of petroleum units, cost analysis. 1½ years' experience steam power plant, refrigeration, and chemical plant equipment. Studying for Master's degree in industrial engineering. Desires permanent position in essential work with definite postwar future. 2B deferment. Can obtain release. Address CA-1183, care of "Mechanical Engineering."

MATERIALS HANDLING ENGINEER, B. C. E., 20 years' structural, mechanical and electrical experience in the design and installation of complete plant equipment for metallurgical, industrial, chemical and process plants. Address CA-1198, care of "Mechanical Engineering."

DIESEL ENGINEER—Over 20 years experience in design, research test and field service of all class of engines with leading European and American firms. Speaks English, French, German and Italian. Seeks position with large American Diesel engine or oil company in U. S. A. or foreign service. Address CA-1202, care of "Mechanical Engineering."

EMPLOYMENT AGENCIES AND SERVICE BUREAUS

EXECUTIVES, ENGINEERS, DESIGNERS, METALLURGISTS needed for Cleveland area. Good salaries. No fee until placed. Write immediately to Bradley Placement Service, 555 Leader Building, Cleveland, Ohio.

SALARIED POSITIONS—$2,500 to $25,000. This advertising service of 34 years' recognized standing negotiates for positions of calibre indicated. Procedure individualized to your personal requirements. Retaining fee protected by refund provision. Identity covered. If salary has been $2,500 or more send for details. R. W. Bixby, Inc., 115 Delward Bldg., Buffalo, N. Y.

E. G. Stroud, Member A.S.M.E., President The Cleveland Engineering Agency Co., 219 Huron-Ninth Building, Cleveland, Ohio, has for 30 years been engaged in technical placement work. Employers wishing to engage Executives, Engineers, Designers, Draftsmen or other technical men are invited to use this service. Applicants available should write for blank and list of opportunities.

BUSINESS OPPORTUNITIES

WANTED:

NEW POWER PLANT SPECIALTIES

To Manufacture and Market

A manufacturer of steam power plant equipment with 40 years' experience in this field and a nationwide sales organization is interested in adding several new products to his line. This company has a strong financial position and has adequate research facilities for testing new products and doing any further development that may be needed. Address all information to

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TO MANUFACTURERS

Inventors: Have you patents for disposal here or abroad?
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INVENTORS OR ENGINEERS

If you have a metal product, patented or patent pending, or an invention beyond the idea stage on which you can furnish clear sketches and written description, write us fully about it. We may have an interest in common. Your rights will be scrupulously respected.

NATIONAL MACHINE PRODUCTS
154 West Slauson Avenue, Los Angeles 3, Calif.

IF YOU NEED SOME HELP IN INDIA, MIDDLE EAST, NORTH AFRICA OR RUSSIA, American Engineer and business man with years of construction experience, now residing in India, will execute any technical assignment, run errands, etc., for moderate fee. Speaks French, Russian and Arabic. Address CA-1200, care of "Mechanical Engineering."

EQUIPMENT FOR SALE

Available soon at a reasonable price TWO—210 HP HRT BOILERS, design pressure 132 lbs. per square inch; operating pressure 115 lbs. per square inch. Equipped with Flynn and Emrich Stokers 5 years' old. Must be sold at once to make room for larger capacity installations. Inquire Howard Tinsman, Chief Engineer, The Armstrong Rubber Co., West Haven 16, Connecticut.

GOVERNMENT MATERIAL FOR SALE—Raw and fabricated materials, standard parts, motors, hardware, fabrics, precision tools, equipment, and other surplus stocks are being offered for sale by the Army Air Forces. Companies interested in such materials, and who are desirous of having their names placed on the active bidders list are invited to write to the Army Air Forces, Air Technical Service Command, Midwestern Procurement District, Municipal Airport, P. O. Box 117, Wichita, Kansas. Attention: Property Disposal Section.

GOVERNMENT MATERIAL FOR SALE—Raw and fabricated materials, standard parts, motors, hardware, fabrics, precision tools, equipment, and other surplus stocks are being offered for sale by the Army Air Forces. Companies interested in such materials, and who are desirous of having their names placed on the active bidders list, are invited to write to the Army Air Forces, Materiel Command, Midcentral Procurement District, 111 West Jackson Boulevard, Chicago 4, Illinois. Attention: Redistribution & Salvage Section.

BOOKS FOR SALE

A.S.M.E. Transactions, bound 1922 through 26, not bound 39 and 40, parts of 38, 41, 42. Records and Index bound 1927 and 29. Excellent condition. Ency. Britannica 9th Edition, good condition. Howard R. Booth, 1814 N. Cleveland St., Arlington, Va.

BOOKS WANTED

BOOKS WANTED—A.S.M.E. TRANSACTIONS (bound) for years 1927-28, 1929, 1931, 1935, 1938. State price and condition of volume. Address CA-928, care of "Mechanical Engineering."

Mr. Manufacturer

AN UNEQUALLED OPPORTUNITY to be in the commanding position in the power producing equipment of the future. A new method for power generation will give higher efficiencies and lower costs than any means in use today. Not dependent on oil. Applicable to locomotives, ships, central power stations, trucks, tractors, industrial plants and others. Patents and patents pending. Require medium size and high grade shop facilities. High grade engineering and sales promotion is a requisite.

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care of "Mechanical Engineering."

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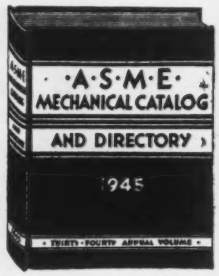

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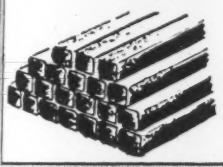
Darnell Corp.
*Downingtown Iron Works
Eagle Pencil Co.
Elastic Stop Nut Corp.
Electro Metallurgical Co.
Elgin Softener Corp.
Eutectic Welding Alloys Co.
Exposition of Power & Mechanical Engineering, 16th National
Faber, A. W. (Inc.)
Faber, Eberhard, Pencil Co.
Fafnir Bearing Co.
*Fulton Sylphon Co.
Garrett, George K., Co.
General Instrument Corp.
Geometric Stamping Co.
*Gifford-Wood Co.
Graver Tank & Mfg. Co.
Guardian Electric Mfg. Co.
Hamilton Mfg. Co.
Hanlon-Waters (Inc.)
Hannifin Mfg. Co.
Hassall, John (Inc.)
Higgins Ink Co.
*Johns-Manville
Laminated Shim Co.
Laminum Div.
Lasker Engineering Co.
Leiman Bros. (Inc.)
Lincoln Electric Co.
Lisle Corp.
Lubriplate Div. Fiske Bros. Refining Co.
Ludlow Saylor Wire Co.
McAlear Mfg. Co.
Macmillan Co.
Marlin-Rockwell Corp.
Meier, Joshua, Co.
Melind, Louis, Co.
*Merco-Nordstrom Valve Co.
Midwest Piping & Supply Co.
*Murray, D. J., Mfg. Co.
*National Airoil Burner Co.
National Forge & Ordnance Co.
Niagara Blower Co.
Nordberg Manufacturing Co.
Ohio Nut & Bolt Co.
Ohmite Mfg. Co.
Orange Roller Bearing Co.
Ozalid Products Div. General Aniline & Film Corp.
Phoenix Mfg. Co.
Reeves Pulley Co.
Rhoads, J. E. & Sons
*Robertson, John, Co.
Ronald Press
*Roots-Connersville Blower Corp.
Roper, George D., Corp.
Shafer Bearing Corp.
Small Electric Motors (Canada) Ltd.
Smooth-On Mfg. Co.
Stewart, F. W., Mfg. Corp.
*Sturtevant, B. F., Co.
Sturtevant, P. A., Co.
Superior Bearing Bronze Co.
*Taylor Instrument Cos.
*Todd Combustion Div., Todd Shipyards Corp.
*Tomkins-Johnson Co.
*Vogt, Henry, Machine Co.
*Westinghouse Air Brake Co.
Wiley, John & Sons
Zagar Tool (Inc.)

FORGINGS POSSESS HIGH STRENGTH and TOUGHNESS

● Forging, or hot working metal, with closed impression dies directions the fiber structure, inherent in steel, to provide high strength and toughness where most needed to resist stress or shock. Maximum strength for a given amount of weight is just one of seven advantages that forgings offer.

These Are Other Advantages:

FORGINGS CONSERVE METAL



FORGINGS LESSEN SCRAP; UNUSUALLY FREE OF CONCEALED DEFECTS; PRACTICALLY NO REJECTIONS

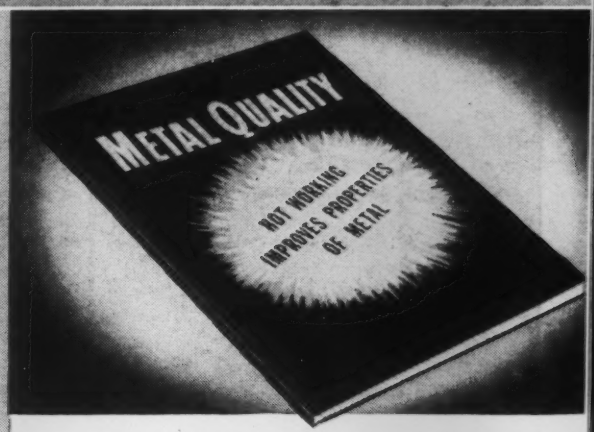
FORGINGS REDUCE DEAD WEIGHT THROUGH MAXIMUM STRENGTH IN LIGHTER SECTIONAL THICKNESSES

FORGINGS FACILITATE RAPID ASSEMBLY THROUGH WELDING ADAPTABILITY

FORGINGS REQUIRE LESS TIME TO MACHINE AND FINISH BECAUSE SHAPED IN CLOSED DIES

FORGINGS REDUCE ACCIDENTS TO MEN AND MACHINES THROUGH A GREATER MARGIN OF SAFETY

Are you obtaining the utmost benefit from your use of forgings? A recheck of every forged part you use against these advantages may reveal unusual benefits which have been unintentionally neglected or overlooked. Even manufacturers who have had long experience in the use of forgings have found further opportunities to *reduce weight, improve product performance and effect worth-while savings* by rechecking parts against these advantages. • Consult a forging engineer connected with your source of supply. His broad experience will be helpful to you in obtaining the utmost benefit from each advantage in your use of forgings.



This new booklet will help you to avoid misestimating the qualities required to meet a specific service condition. Metal quality can be developed to the exact degree required by the forging process, and this booklet presents many examples that prove it. It contains 40 pages of factual information about the development of maximum strength and toughness in forgings. Over 200 illustrations are used, most of them for the purpose of showing directioned fibre structure, or grain flow as obtained by forging. This booklet has been prepared for the guidance of design engineers, metallurgists, and other technicians, production and management executives; whose task it is to determine the metal quality required for *safety and dependable performance.* Ask your source for forgings for a copy, or write direct.

Drop Forging Topics contains technical information for design engineers, production executives, metallurgists, and other technicians who specify and use metal parts for operating mechanisms. It is published ten times a year; usually contains 8 pages and is available upon request. Is your name on *Topics* mailing list?

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- ☐ "Drop Forging Topics," issued ten times a year

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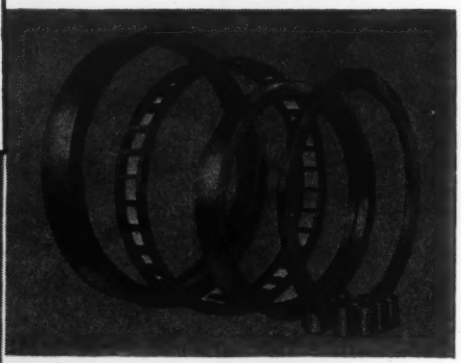
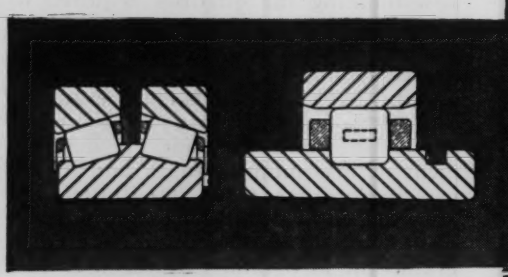
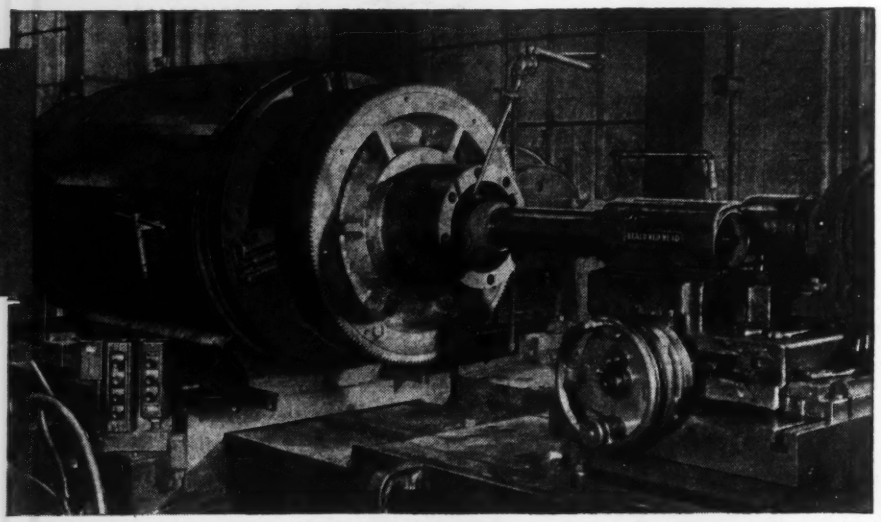
IN THE NEWS
WITH TORRINGTON BEARINGS

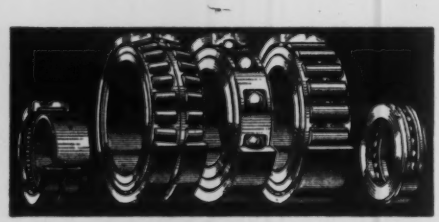


MEETING DESIGN REQUIREMENTS of the Emsco Derrick & Equipment Company, the engineers of Torrington's Bantam Bearings Division custom-built the 27½" O.D. Radial Roller Bearings employed in the sheaves of the crown and traveling blocks. The bearings, mounted on a center drum, are located close to the rope grooves to conserve wire line, prevent hazardous tilting, and to minimize wear on the sheaves.

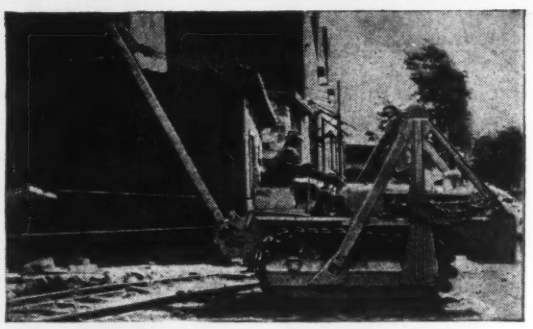




GRINDING HEAVY PARTS TO PRECISION LIMITS, this mammoth grinder, built by the Ingersoll Milling Machine Company, utilizes a Torrington Tapered Roller Bearing to carry the heavy radial and thrust loads encountered in the operation of the spindle. It is mounted directly behind the chucking mechanism which holds the work in position for grinding. A tapered bore radial roller bearing is mounted on the back end of the spindle, where a "V" belt pulley connects direct to the motor drive. After four years in operation the eccentricity and face run-out of these bearings is .00025.



DESIGNERS of this Williamette Hyster towing winch, installed on a Caterpillar tractor, specified heavy-duty Torrington Needle Bearings for use in the idler and reverse gears. The Williamette Hyster Company says, "Because of the restricted space in the comparatively small gears, needle bearings are the only practical type of anti-friction bearings that can be used."



EVERY MAJOR TYPE OF ANTI-FRICTION BEARINGS is included in the Torrington line—straight roller, tapered roller, needle and ball. In addition to supplying every branch of industry with a wide range of standard bearings, the engineering staff of Torrington's Bantam Bearings Division designs bearings in large sizes and of special types for new or unusual applications. For experienced counsel in meeting today's requirements—or assistance in postwar plans TURN TO TORRINGTON.

ARMY E NAVY

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SOUTH BEND 21, INDIANA

HIGH SPEED PLANING

and superior finishes
ACHIEVED BY ALL-INCLUSIVE RIGIDITY

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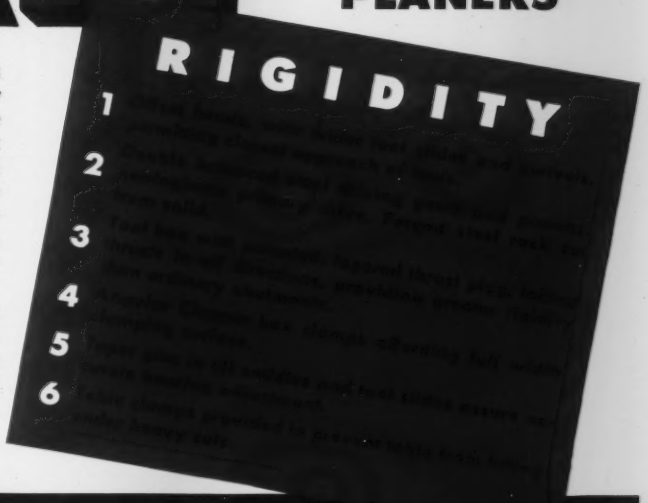
CONVERTIBLE PLANERS



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LE BLOND

[illegible] center in the two spin-[illegible] crankshaft is held [illegible] through a driving [illegible] 50/20 H.P. motor de-[illegible] 1,200 R.P.M.

[illegible] necessary rigidity and [illegible] spindles and to protect [illegible] radial, thrust and combined [illegible] mounted on Timken Tapered [illegible] Le Blond leaves noth-[illegible] Timken Roller Bearing Company, Canton, Ohio.

TIMKEN
TAPERED ROLLER BEARINGS